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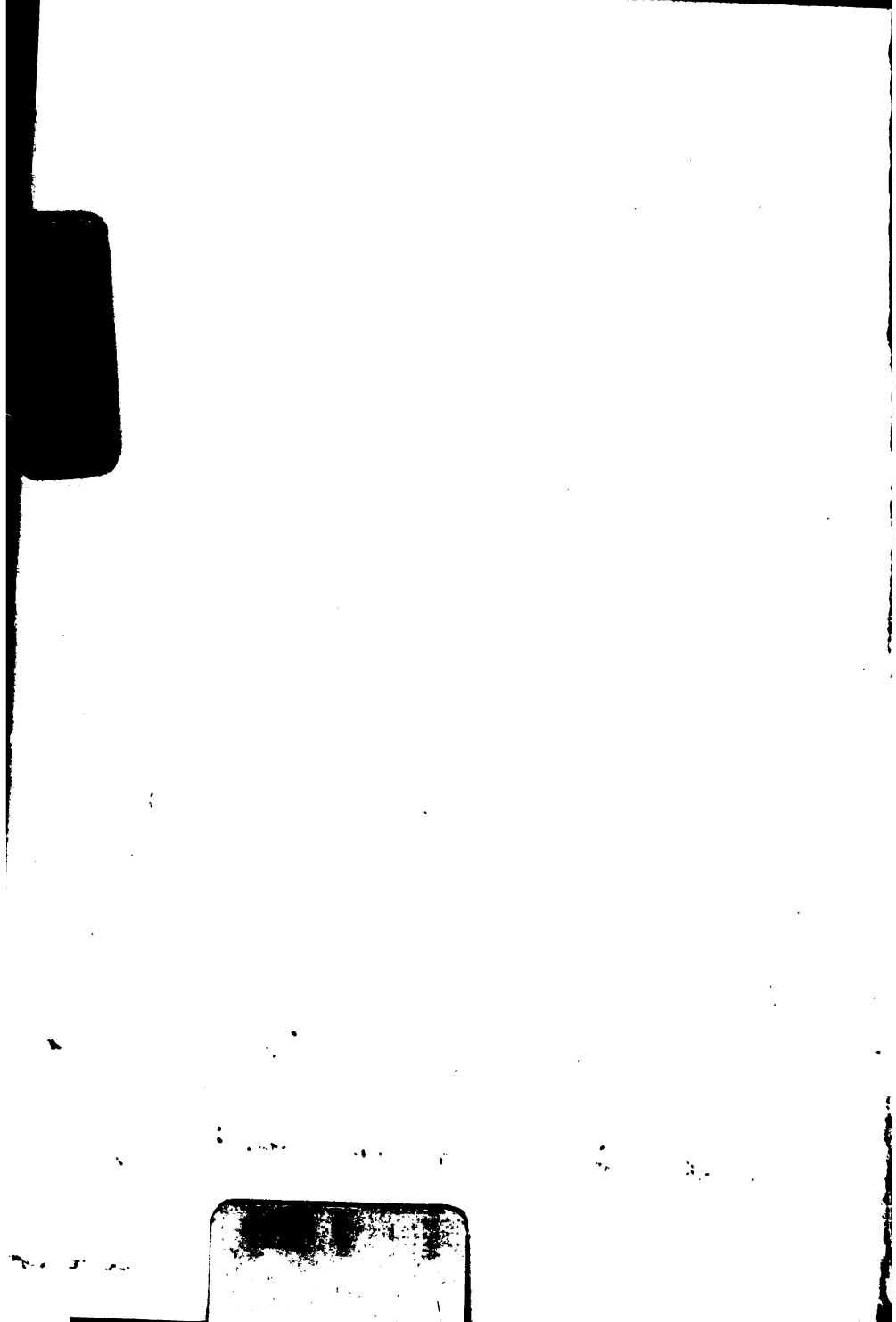
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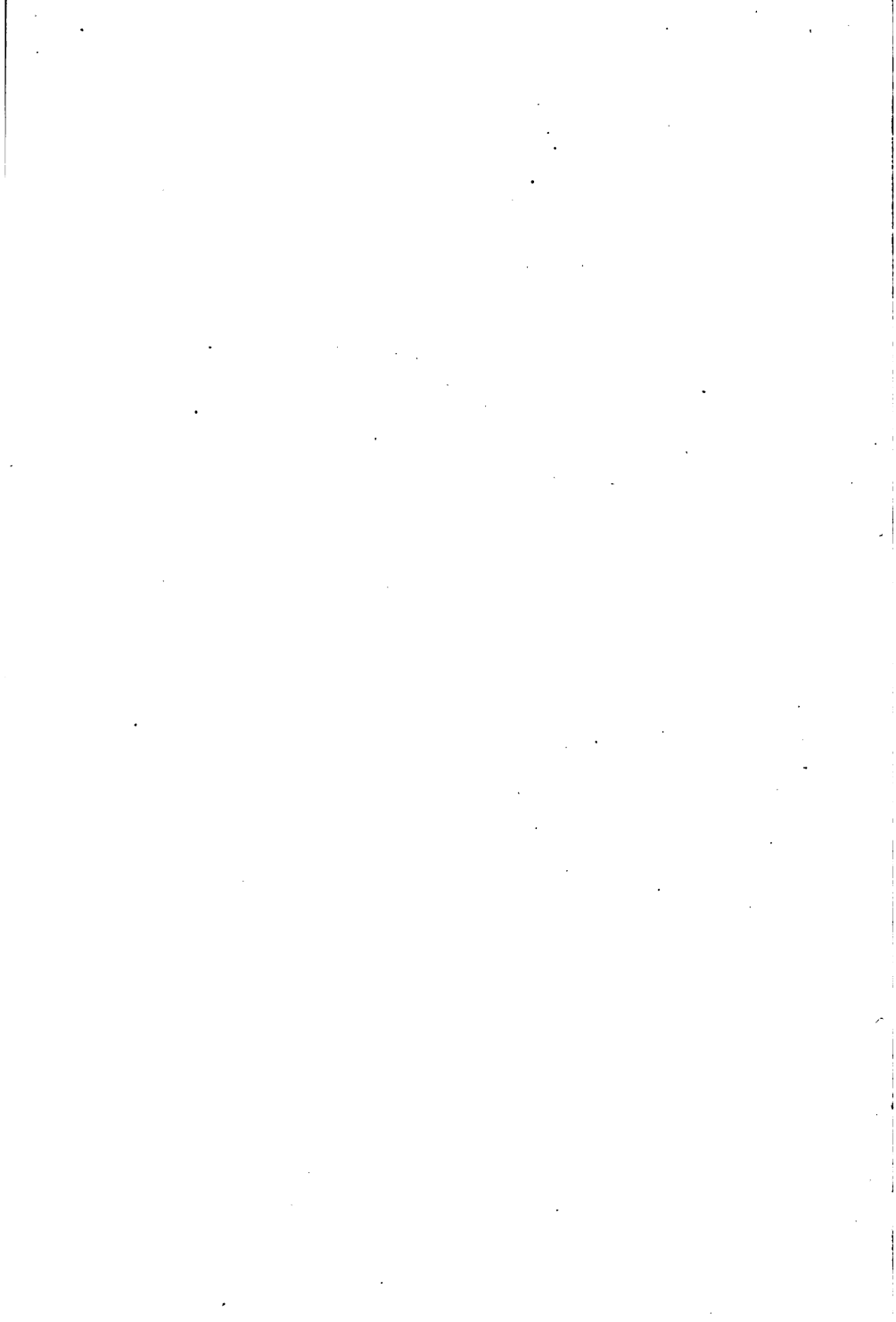
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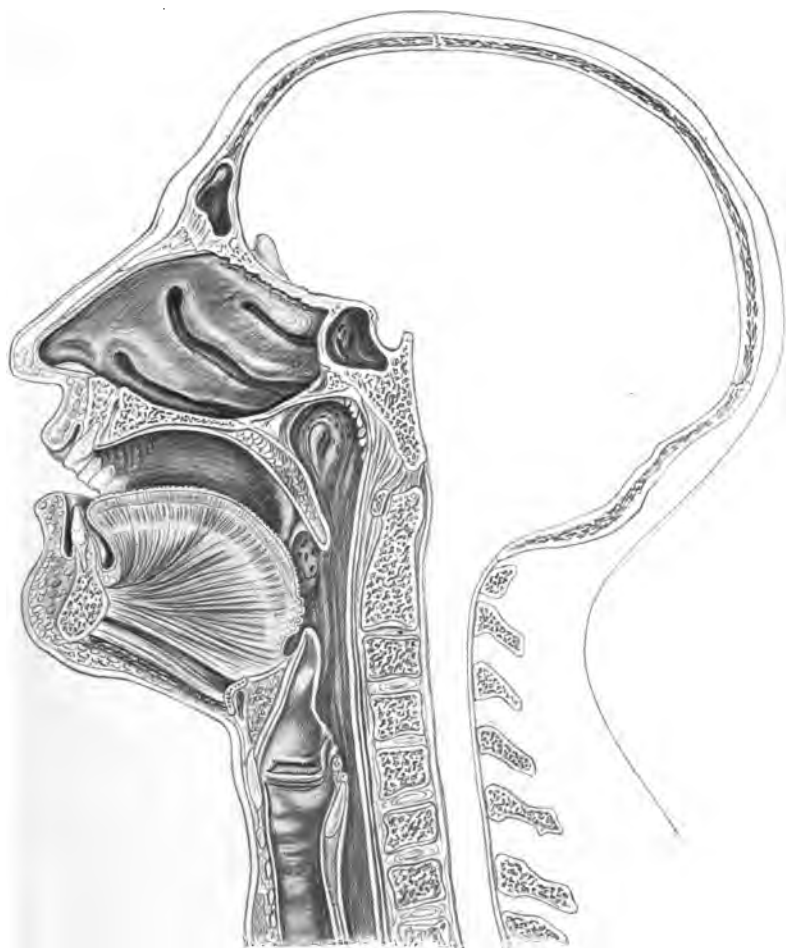


FIG. 1.—The upper respiratory tract (Luschka).

DISEASES
of the
NOSE AND THROAT

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ILLUSTRATED

PHILADELPHIA AND LONDON
W. B. SAUNDERS COMPANY

1915

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PREFACE

The object of this book is to guide the student or practitioner of medicine in his clinical work, by giving him a ready reference to the important details of examination, diagnosis and treatment of the upper respiratory tract.

A small manual is no longer able to contain all of the information which the student must occasionally seek in books of reference, but it should be useful in presenting the different subjects in their proper perspective. With this in view, established facts and well-authenticated theories have been accentuated, and as far as possible unproved statements and superfluous treatment have been avoided. The anatomy and physiology of the different regions are briefly reviewed as far as it is important to bear them in mind in examination and treatment. The etiology and pathology of the different diseases are somewhat fully taken up when they are of practical importance or theoretical interest.

There are many things which can only be learned by clinical experience, but also much that is overlooked if this practical work is not accompanied by a reasonable amount of didactic study. The examination of patients, the choice of instruments and the technique of operations vary so much in detail in different clinics and with different operators, that the student should expect to get only general principles from his text-books. To become skilful his training must be with patients, but to acquire good judgment in the interpretation of symptoms, and in the question of operation in doubtful cases, the subject must be studied from all sides. For this reason considerable space is given to arguments for and against the more common operations, and other methods of treatment.

The illustrations are intended to help the text in places where a diagram can be used to make a point clear. Cuts of instruments have been almost entirely omitted, because the student seldom lacks the opportunity of a much better study of them in a clinic or in the catalogues of manufacturers.

A. COOLIDGE.

613 BEACON STREET, BOSTON, MASS.

September, 1915.

CONTENTS

CHAPTER I

	PAGE
METHODS OF EXAMINATION	II
Historical, 11; Illumination, 12; Examination of the Fauces, 15; Examination of the Anterior Nares, 16; Examination of the Posterior Nares, 18; Examination of the Larynx, 20; Examination of the Trachea, 22; Direct Laryngoscopy, 22; Transillumination, 25; Diagnosis by X-ray, 27.	

CHAPTER II

CLINICAL HISTORY.	28
Nasal Obstruction and Secretion, 31; Hoarseness, 32; Cough, 32; Obstruction to Breathing, 33; Pain, 34.	

CHAPTER III

ANATOMY AND PHYSIOLOGY OF THE NOSE	35
The External Nose, 35; The Profile, 35; The Nasal Vestibules, 37; The Nasal Septum, 38; The Nasal Cavities, 39; The Accessory Sinuses, 42; The Maxillary Sinus, or Antrum of Highmore, 45; The Frontal Sinuses, 45; The Ethmoid Cells, 46; The Sphenoidal Sinuses, 47; Physiology of the Nose, 47; Physiology of the Accessory Sinuses, 51.	

CHAPTER IV

DISEASES OF THE EXTERNAL NOSE.	53
Fracture of the Nasal Bones, 53; Deformities of the External Nose, 59; Lateral Deviations, 59; Saddle-back Nose, 62; Diseases of the Vestibule, 63; Eczema of the Vestibule, 64; Furunculosis, 64; Lupus, 65; Erysipelas, 65; Anterior Fissure, 65; Collapse of the Alæ, 66.	

CHAPTER V

DISEASES OF THE NASAL SEPTUM	68
Erosion of the Septum, 68; Perforation of the Septum, 69; Abscess of the Septum, 70; Ulceration of the Septum, 71; Sep-	

tal Adhesions, 71; Deviations of the Nasal Septum, 72; Submucous Resection, 81; Other Operations, 84; Epistaxis, 86.

CHAPTER VI

DISEASES OF THE NASAL CAVITIES 91

Acute Rhinitis, 91; Colds, 92; Chronic Rhinitis, 99; Catarrhal Rhinitis, 100; Intumescent, Hyperplastic and Hypertrophic Rhinitis, 101; Turbinotomy, 104; Hypertrophy of the Posterior End of the Lower Turbinate, 105; Chronic Rhinitis with a Tendency to Atrophy, 106; Atrophic Rhinitis, 106; Syphilis of the Nose, 110; Tuberculosis of the Nose, 112; Lupus, 112; Vasomotor Rhinitis—Hay Fever, 113; Nasal Asthma, 121; Nasal Neuroses, 123; Reflex Coryza, 124; Neuroses from Contacts, 124; Sphenopalatine Neuralgia, 125; Anosmia, 126; Nasal Hydrorrhea, 127; Nasal Mucous Polypus, 128; Foreign Bodies in the Nose, 134; Narrow Nasal Cavities, 135.

CHAPTER VII

DISEASES OF THE ACCESSORY SINUSES 137

Acute Sinusitis, 137; Chronic Sinusitis, 138; The Maxillary Antrum, 139; Acute Maxillary Sinusitis, 139; Chronic Empyema of the Antrum, 140; The Frontal Sinus, 145; Acute Frontal Sinusitis, 145; Empyema of the Frontal Sinus, 147; Killian's Operation, 149; Diseases of the Ethmoid Cells, 151; Removal of the Middle Turbinate, 153; Operations to Open the Ethmoid Labyrinth, 154; Diseases of the Sphenoidal Sinus, 155; Acute Sphenoidal Sinusitis, 155; Chronic Empyema, 155.

CHAPTER VIII

TUMORS OF THE NASAL AND ACCESSORY CAVITIES 157

Angioma of the Septum, 157; Dentigerous Cyst, 157; Tubercular Tumors, 158; Bulloous Middle Turbinate, 158; Mucocele, 159; Malignant Tumors, 160; Carcinoma, 160; Sarcoma, 160; Nasopharyngeal Polypus, 161; Fibroma of the Nasopharynx, 161.

CHAPTER IX

ANATOMY OF THE PHARYNX 165

The Nasopharynx, 165; The Soft Palate, 167; The Uvula, 167; The Pharynx, 168.

CONTENTS

7

CHAPTER X

	PAGE
THE TONSILLAR RING	170
The Physiology of the Tonsillar Ring, 172; Adenoids, 174; The Faucial Tonsils, 180; Acute Tonsillitis, 185; Subacute Tonsillitis, 189; Peritonsillar Abscess—Quinsy, 190; Enlarged Tonsils, 194; Retained Secretion, 196; Chronic Tonsillitis, 197; Removal of the Tonsils, 199; Tonsillectomy, 201; Hemorrhage after Tonsillectomy, 204; Keratosis Tonsillaris, 206; Foreign Bodies in the Tonsil, 208; Concretions, 208; Bone in the Tonsil, 208; The Lingual Tonsil, 208.	

CHAPTER XI

DISEASES OF THE PHARYNX	210
Diseases of the Nasopharynx, 210; Acute Nasopharyngitis, 210; Chronic Nasopharyngitis, 210; Acute Pharyngitis, 211; Chronic Pharyngitis, 213; Granular Pharyngitis, 214; Elongation of the Uvula, 214; Acute Erosions of the Pharynx, 216; Herpes of the Fauces, 217; Membranous Pharyngitis, 218; Vincent's Angina, 219; Ludwig's Angina, 220; Syphilis of the Pharynx, 220; Tuberculosis of the Pharynx, 222; Lupus of the Pharynx, 223; Retropharyngeal Abscess, 223; Tumors of the Pharynx, 225; Papilloma, 225; Angioma, 226; Fibroma, 226; Cysts, 226; Lipoma, 226; Accessory Thyroid Gland, 226; Sarcoma, 227; Carcinoma, 227.	

CHAPTER XII

ACUTE CONSTITUTIONAL DISEASES	228
Diphtheria, 228; Scarlet Fever, 233; Measles, 233; Chicken-pox, 234; Glanders, 234.	

CHAPTER XIII

CHRONIC INFILTRATING AND ULCERATING DISEASES	235
Syphilis, 237; Tuberculosis, 243; Lupus, 244; Leprosy, 246; Scleroma, 247; Actinomycosis, 248.	

CHAPTER XIV

ANATOMY AND PHYSIOLOGY OF THE LARYNX	250
The Cartilages, 250; The Thyroid Cartilage, 250; The Cricoid	

Cartilage, 251; The Arytenoid Cartilages, 251; The Epiglottis, 252; **The Cavity of the Larynx**, 253; The Ventricular Bands, 253; The Vocal Cords, 253; The Ventricles of the Larynx, 254; The Blood Supply, 254; The Mucous Membrane, 254; **The Muscles of the Larynx**, 254; The Cricothyroid Muscles, 255; The Posterior Crico-arytenoid Muscles, 256; The Lateral Crico-arytenoid muscles, 256; The Arytenoideus Muscle, 256; The Thyro-arytenoid Muscles, 256; **The Nerves of the Larynx**, 256; The Superior Laryngeal Nerve, 256; The Recurrent Laryngeal Nerve, 257; **Physiology of the Larynx**, 258; Speech, 259.

CHAPTER XV

DISEASES OF THE LARYNX. 261
Acute Laryngitis, 261; **Croup**, 263; **Subglottic Laryngitis**, 263; **Laryngismus Stridulus**, 265; **Edema of the Larynx**, 266; **Chronic Laryngitis**, 268; **Chronic Atrophic Laryngitis**, 269; **Perichondritis of the Larynx**, 270; **Syphilis of the Larynx**, 270; **Tuberculosis of the Larynx**, 271; **Lupus of the Larynx**, 277; **Stenosis of the Larynx**, 277; **Singer's Nodes**, 279; **Pachydermia of the Larynx**, 281; **Congenital Laryngeal Stridor**, 282.

CHAPTER XVI

NEUROSES OF THE LARYNX. 284
Sensory Disturbances, 284; **Motor Disturbances**, 285; **Abductor Paralysis**, 286; **Complete Paralysis of the Recurrent Nerve**, 287; **Spasm of the Glottis**, 288; **Laryngeal Vertigo**, 289; **Hysterical Aphonia**, 289; **Defects in Speech**, 291; **Backwardness in Speech**, 292; **Stammering**, 293; **Falsetto Speech**, 293; **Defects in Speech of Peripheral Origin**, 293.

CHAPTER XVII

TUMORS OF THE LARYNX. 295
Polyp of the Vocal Cords, 295; **Papilloma of the Larynx**, 296; **Thyroglossal Cyst**, 302; **Cancer of the Larynx**, 303.

CHAPTER XVIII

INTUBATION AND TRACHEOTOMY. 306
Intubation, 306; **Direct Intubation**, 307; **Tracheotomy**, 308.

CHAPTER XIX

BRONCHOSCOPY AND ESOPHAGOSCOPY.	PAGE
	311
Bronchoscopy, 312; Foreign Bodies in the Larynx, 315;	
Foreign Bodies in the Trachea, 315; Foreign Bodies in the	
Bronchi, 316; Esophagoscopy, 318; The Esophagus, 320.	

CHAPTER XX

THE MOUTH AND TONGUE	323
Acute Erosions, 323; Aphthæ, 324; Stomatitis, 325; Scurvy,	
327; Thrush, 327; Noma, 328; Pemphigus, 328; Acute	
Glossitis, 329; Leucoma, 329; Geographical Tongue, 331;	
Hairy Tongue, 332; Tongue Tie, 332; The Salivary Glands,	
332; Ranula, 334; The Teeth, 335; Epulis, 336; Cleft Pal-	
ate, 336.	

CHAPTER XXI

THERAPEUTICS	339
Sprays, 339; Gargles, 340; Douches, 341; Mouth Washes,	
342; Inhalations, 343; Insufflations, 343; Lozenges, 343;	
Ointments, 344; Caustics, 344; Cocaine , 345; Substitutes for	
Cocaine, 347; Adrenalin , 348; Nitrate of Silver, 348.	

INDEX	351
------------------------	------------

MANUAL OF DISEASES OF THE NOSE AND THROAT

CHAPTER I

METHODS OF EXAMINATION

HISTORICAL

IN the medical literature of a hundred years ago there is occasionally recorded a successful attempt to see the inside of the larynx. Bozzini in 1807 used a little mirror at the end of a double canula, one to carry down the light, the other to bring up the reflected rays. Cagniard de la Tour in 1825 and Babington in 1829 saw the vocal cords by reflected light. The possibility of doing so appears to have been periodically recognized, but without exciting any general interest, until Manuel Garcia in 1855 made his laryngoscope, and drew attention to its importance. Türk two years later started the first laryngologic clinic. About the same time Czermak introduced the perforated head-mirror, which was an essential addition to the development of laryngoscopy. Beginning thus with a device for seeing the larynx, the specialty of laryngology has been growing for the past fifty years. By turning the reflect-

ing mirror upward the nasopharynx was seen. The examination of the nasal cavities from the front became easy with the introduction of the perforated head-mirror. One by one different operations were devised, made possible by laryngoscopy.

The laryngoscope shows the larynx by reflection in a mirror but it is also possible to see it directly. The first practical speculum for this direct inspection was made by Kirstein in 1890 and called by him an autoscope. It resembled an elongated tongue-depressor. Later Killian modified this into a closed tube with a lip at the end, the tube-spatula, which he developed into his bronchoscope by elongating the tube.

ILLUMINATION

In order to see clearly into the different cavities of the body it is necessary that the line of vision should coincide with the direction of the illuminating rays. This can be done by the simple expedient of reflecting light from a mirror with a small hole in the center, through which hole the eye follows the illuminating rays, and sees the same point that is illuminated. To look around a corner a small mirror at the proper angle is placed at this corner. Thus the interior of the larynx is seen by reflecting the light downward, and the posterior nares by directing it upward from the oropharynx. In order to get as much light as possible into a cavity it is obvious that the illuminating rays, instead of being parallel, should be concentrated

at the narrowest point through which they must pass. In the case of the nasal cavity, for instance, only as much light as enters the nostril is of use inside the cavity, all that illuminates the external face is wasted. The head-mirror, therefore, is made concave to condense the light into a focus at the external nose, or upon the laryngeal mirror held in the pharynx. This focusing of light is only to increase its brilliancy at the point where it is most needed, and consequently does not demand fine adjustment. The distance from the concave mirror at which the light is most concentrated will depend upon the degree of concavity and the distance of the source of light, the farther away the lamp is placed the nearer parallel will be its rays and the sooner they will be brought together by the mirror. The focal distance of the mirror should be that at which the observer can best see and work. For the ear and anterior nares a mirror of shorter focal distance than for the larynx and posterior nares is theoretically advisable, but one that will focus parallel rays at from six to eight inches is practical for all purposes. A mirror which focuses parallel rays at seven inches will focus the rays of a light placed just behind the patient at twelve inches.

An excellent light is obtained by gas and a Welsbach mantle. Electric light will generally throw an uneven reflection on account of the filament, although this can be avoided by proper appliances. A kerosene lamp can be made efficient, whereas a candle is generally unsatisfactory. A metal covering letting the light out only in one

direction through a lens adds much to the clearness of vision. In many respects no light is so good as direct sunlight; this, however, is often difficult to regulate, and so strong that care must be taken not to focus it if a concave head-mirror is used.

The direction of the light should be such that the angle of reflection is as acute as possible, generally from just behind and above the patient's ear. The head-mirror is adjusted so that in looking through the hole, the examiner sees the center of the circle of light upon the patient's face.

Instead of a reflecting head-mirror a small electric lamp is sometimes attached to the head-band, so near to the eyes that its rays are nearly enough parallel to the line of vision to enable the examiner to see well into a cavity which is not too narrow or too deep, such for example as the pharynx; or a combination of this small lamp with a perforated reflecting mirror brings the illumination and the vision into line so that any cavity may be inspected. This has the great advantage of allowing the observer to move his head about without throwing his illumination out of adjustment. It has the disadvantage of being a more elaborate and delicate apparatus, and generally that of giving less light.

The necessary instruments for examination are a head-mirror with a focal distance of about seven inches, a set of small mirrors, of which one of a diameter of seven-eighths and one of one-half inch will be the most frequently used, a

tongue-depressor, a nasal speculum, nasal forceps, probe and applicator. These instruments should be boiled after use to avoid all danger of infection. Some mirrors are made to withstand boiling, if not they should be carefully washed and cleaned with alcohol.

EXAMINATION OF THE FAUCES

As the faucial cavity is broad in proportion to its depth, reflected light is not necessary. If the head-mirror is used it may be turned up onto the forehead so that both eyes are used simultaneously. In most cases the arch of the tongue obstructs the view and must be depressed by pushing it downward and somewhat backward. A tongue-depressor with a right angle bend is better than a straight one, as it takes the hand out of the line of vision. The principal obstacle is reflex gagging on the part of the patient, which varies much in different cases, but which is always greater if the tongue-depressor is put too far back on the tongue. It is better to keep the depressor on the anterior half of the tongue even if more force is necessary to keep it down. The patient should not hold his breath, and should make no muscular effort except to open his mouth.

Having depressed the tongue we see the lower surface of the soft palate, with the dependent uvula, and the pillars of the fauces, two folds of mucous membrane on each side running from the sides of the uvula, the anterior to be inserted into the side of the tongue, and the posterior merging into the lateral walls of the pharynx. The anterior

represents the free edge of the palatoglossus and the posterior the palatopharyngeus muscle. On each side between the two pillars is seen the tonsil, when it is not hidden behind the anterior pillar. The background of the picture is formed by the posterior wall of the oropharynx.

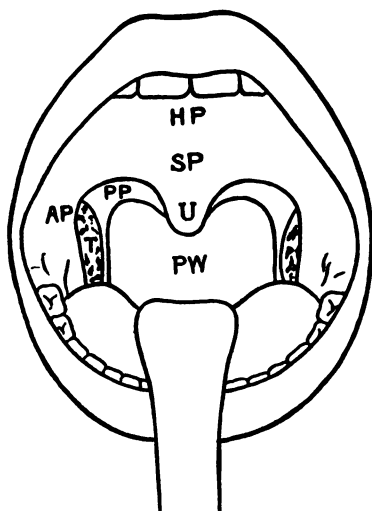


FIG. 2.—The fauces. HP, Hard palate; SP, Soft palate; U, Uvula; AP, Anterior pillar; PP, Posterior pillar; T, Fauical tonsil; PW, Posterior pharyngeal wall.

EXAMINATION OF THE ANTERIOR NARES

This includes as much as can be seen through the anterior nasal openings. The patient sits upright in a chair, the observer either directly in front of him or on his right side. The light from the head-mirror is focused upon the patient's nose, and the nasal speculum introduced so as to

lift the ala, and open a straight passage for the admission of light. There are different forms of specula but as a rule a self-retaining speculum for routine examination is unsatisfactory. As one hand must be given up to holding the speculum the instrument should be large enough to be seized by the hand instead of by the fingers only. It is important that the physician should learn to use it in either nostril, with the left hand, so that the right hand may be

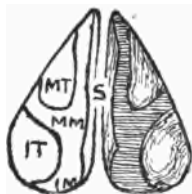


FIG. 3.—Diagram of the anterior nares. MT, Middle turbinate, IT, Inferior turbinate; MM, Middle meatus; IM, Inferior meatus; S, Septum.

free for other instruments. Many patients throw the head back when the speculum is introduced so that the lower part of the nasal cavity is not seen until the head is brought forward again. With the head forward the septum is seen to the inner side, the anterior end of the lower turbinate to the outer side, the nasal floor below, and sometimes in case the septum is straight and the turbinates small, the nasopharynx in the background. The latter may be recognized by asking the patient to speak the word "can," when the upper surface of the soft palate will be seen to rise and fall. The patient's head is then thrown back, so that the upper part of the cavity can be examined.

Here the anterior and lower border of the middle turbinate is seen unless hidden by a spur or deviation of the septum or an enlarged lower turbinate. Having examined the cavity it is well to spray into it a small amount of a weak solution of cocaine, which will in a short time contract the turbinates and give a much better view of the field.

In nearly all cases there will be found irregularities in the septum and the turbinates, which should be carefully noted, and compared with any symptoms of which the patient complains. Experience will show that many of these irregularities which are obvious to the eye have been fully compensated for by nature and have no pathological importance. Also it must be borne in mind that the turbinates, especially the lower, are covered with erectile tissue, the engorgement of which may be a functional and not a pathological process, and that a large turbinate does not often mean a hypertrophied one.

EXAMINATION OF THE POSTERIOR NARES

For this a rhinoscopic mirror of about one-half inch diameter is necessary. In order to see the post-nasal space it is essential that the tongue should be depressed giving a clear view of the fauces with sufficient room between the uvula and tongue, that the mirror should be well illuminated, and that the soft palate should be relaxed. The latter can not be obtained by force, and will often require considerable skill and patience. It is useless to attempt to introduce a rhinoscopic mirror until there is a place in which to put it

and until that place is well lighted. This having been attained the mirror is warmed, or immersed in a half per cent solution of lysol, and carried without touching the tongue or palate into the pharynx, behind and to one side

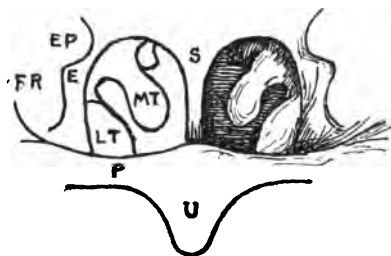


FIG. 4.—The posterior nares as seen in the rhinoscopic mirror. S, Septum; MT, Middle turbinate; LT, Lower turbinate; EP, Eustachian prominence; E, Opening of the Eustachian tube; FR, Fossa of Rosenmueller; P, Soft palate; U, Uvula.

of the uvula. By slightly rotating the handle and moving the mirror as much as possible without touching the pharyngeal wall, the different parts of the region above the palate are brought successively into view. In the median line the funnel-shaped posterior edge of the septum should be sought and from this the other structures are found. On each side are the choanæ, or posterior openings into the nasal chambers. In each choana the posterior and lower edge of the lower turbinate appears, in greatly varying size, in the lower quadrant. External to the choanæ are the orifices of the Eustachian tubes, and above the septum an extensive field which is the vault of the pharynx. If a pharyngeal tonsil or so-called adenoid is present, as is usually the case in children, it will be seen

above the septum, or if it is of sufficient size, it will overlap the choanæ from above and cut off more or less of the view of the septum and posterior nares.

EXAMINATION OF THE LARYNX

The position of the patient is the same as for the examination of the posterior nares, except that his head is thrown somewhat farther back. The principal obstacle to the

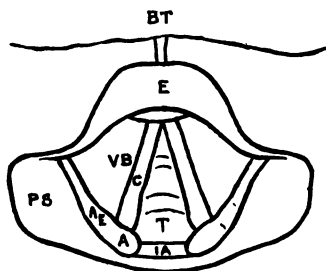


FIG. 5.—Diagram of the larynx as seen in the laryngeal mirror, during inspiration. BT, Base of the tongue; E, Epiglottis; VB, Ventricular band; C, Vocal cord; AE, Aryepiglottic fold; A, Arytenoid; IA, Interarytenoid fold; PS, Pyriform sinus; T, Trachea.

view of the larynx is the epiglottis. In order to get this as far forward as possible the tip of the tongue is held with a napkin between the thumb and finger of the observer's left hand, care being taken not to pull the frenum against the patient's lower teeth. The upper part of the uvula is then visible above the dorsum of the tongue and the light from the head-mirror is thrown upon it. The laryngeal mirror, seven-eighths to an inch in diameter, is warmed or immersed in lysol, passed down above the tongue and held

either just in front of the uvula or with the latter resting on its back. If this does not bring the lower pharynx and larynx into view the patient is asked to say "ah" which by opening the pharynx allows a better position for the mirror. The palate is generally fairly tolerant as compared with the sides of the pharynx or the tongue, but if gagging occurs, the mirror must be withdrawn and another attempt made, touching the fauces as little as possible.

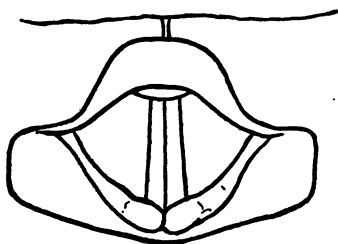


FIG. 6.—The same during phonation.

It must be remembered that the reflected image is an inverted one, and that what is seen at the top is really anterior, and at the bottom posterior. At the top is seen the base of the tongue, below it the epiglottis, on each side the aryepiglottic fold extending from the epiglottis above to the arytenoids below. The arytenoids and the vocal cords are easily identified by their motion, coming together in phonation, and separating in deep inspiration. When the glottis is open the tracheal rings may be seen in the space between the cords. To the outside of each aryepiglottic fold is the pyriform sinus, the lowest part of the pharynx before it merges into the esophagus.

EXAMINATION OF THE TRACHEA

Often much may be learned by a careful examination of the trachea in the laryngeal mirror. Sometimes in the routine examination of the larynx the whole tracheal column to the bifurcation can be seen through the glottis, but in most cases with the patient in the best position for laryngoscopy, with the head thrown back, only the upper part of the anterior wall of the trachea is visible. In order to see the bifurcation the patient's head must be brought forward, while the observer changes his position accordingly, until the whole length of the trachea comes into view. A strong light is essential, preferably sun rays. The bifurcation should then be easily distinguished, and the upper portion of the two bronchi.

Normally the tracheal rings appear distinctly lighter in color than the mucous membrane between them. In cases, however, of acute or chronic inflammation the contour of the rings is lost and the increased redness of the mucous membrane is evident. Secretion if present is seen adherent to the tracheal wall, and changes its position after coughing. The presence of secretion or blood on the tracheal wall is good evidence that it has come up from below.

DIRECT LARYNGOSCOPY

The lower pharynx and larynx may be seen directly by straightening out the angle at the base of the tongue. The speculum used for this purpose is a tube held firmly by a

handle and ending in a lower lip, the tube-spatula of Killian or some modification of it. The tube-spatula of Jackson contains near its distal end a small electric lamp, by which the field is illuminated at close range. The

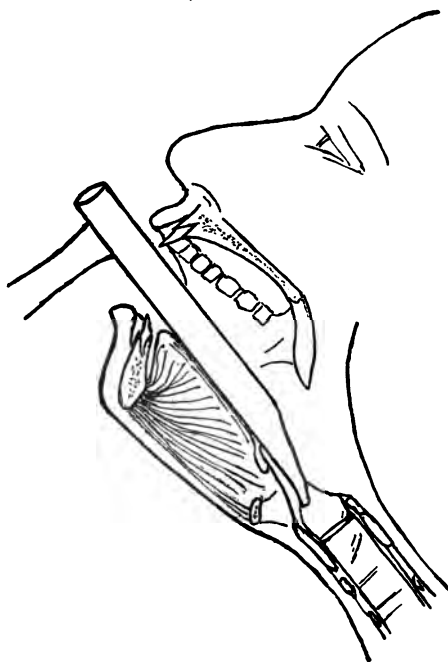


FIG. 7.—Direct laryngoscopy.

spatula of Mosher is open on one side, allowing much more space for inspection and the use of instruments.

The patient may be seated on a low chair with the observer in front of and above him, or he may lie on his back with the observer behind his head. The epiglottis and

neighboring parts must be well cocainized, and even with a general anesthetic the interior of the larynx should be cocainized before attempting any manipulation within it. The patient's head is extended as far as necessary and the lip of the spatula carried over the base of the tongue and behind the epiglottis. By traction forward the whole body of the tongue is pulled out of the line of vision, and the lower pharynx and the interior of the larynx brought into view. The image in this case not being reflected, is the reverse of that seen in the laryngeal mirror. The posterior portion of the larynx can always be seen by direct laryngoscopy, and often, but not always, as far forward as the anterior commissure.

In case of infants the interior of the larynx can generally be seen without an anesthetic by direct laryngoscopy whereas by the older method of reflected light this is often impossible. The infant may be held upright on the lap of an assistant or be placed on its back with its head extended over the end of the table.

Killian's Suspension Laryngoscopy.—With the patient on his back and the speculum in place, the whole head may be raised and suspended by the speculum, which proceeding will sometimes open for direct inspection the deep pharynx and much of the larynx.

Direct laryngoscopy leads the way to bronchoscopy and esophagoscopy, and the operations founded on them, which are described in another chapter.

TRANSILLUMINATION

Transillumination consists in passing light through a sinus and noting if the light is obstructed in its passage. When a small, protected, electric lamp is put into the mouth the light finds its way through a normal antrum and is seen between the floor of the orbit and the eye as a bright crescent, the pupil often appears red and the patient perceives the light in the eye. If the antrum is inflamed or filled with pus, the light fails to go through, and the contrast between that side and the unaffected side is striking. This test is not absolute, as there may be an abnormality of structure, or thick and opaque bone, but a marked opacity on the suspected side as compared with the other, is strong evidence of trouble in the antrum. Not infrequently neither side shows definite orbital light, but this can not be considered good evidence of bilateral trouble, only the relative intensity of the light on the two sides is of value for diagnosis.

The lamp should be small and the light intense, generally close to the maximum voltage that the lamp will stand, and for purposes of cleanliness inclosed in a removable glass tube. As soon as the light is deflected even a little from the median line, the orbit of that side, in a normal case, will become markedly brighter than the other. Many cases which appear dark on both sides when the lamp is in the middle line, will light up sufficiently for a proper diagnosis when the lamp is pressed against the alveolar process.

The antrum may also be transilluminated from a point external to the alveolar process. For this purpose the lamp is placed between the cheek and the posterior portion of the alveolar process behind the canine fossa. The light is here diffused in the neighborhood of the lamp by the skin, but this can be distinguished from the light which has gone through the antrum and shines in the floor of the orbit. From this position less light is required to penetrate through the antrum into the orbit, and a positive finding can sometimes be made, when from the mouth cavity it was negative.

That evidence of disease of the antrum which is given by transillumination is always circumstantial, nevertheless it is often valuable.

Transillumination should be a part of the routine examination of every case. It takes little time, is never resented by the patient, and will more frequently than some of us realize call attention to trouble in the antrum which might otherwise be overlooked.

The frontal sinus is transilluminated by covering the lamp with an opaque cap open only at the end, and pressing the open end firmly against the roof of the orbit above the inner canthus. If it is translucent, a rough outline of a large frontal sinus appears traced in light on the forehead. This evidence is not so valuable as in the case of the antrum. Owing to the great difference in the size and shape of frontal sinuses, no good conclusions can be reached by transillumination of these cavities unless their size is previously known

by *x*-ray plates. If the size of the cavities is known, the lack of transmission of light, where it might be expected, shows that something is wrong in the cavity.

DIAGNOSIS BY X-RAY

The *x*-ray plate is of great value in showing the size and shape of the frontal sinuses, and to a less extent the other sinuses. It also indicates whether a sinus is pathological. A plate taken with the face lying upon it shows the orbits, the septum, the turbinates and the hard palate. The outline of the frontals can normally be distinctly traced on the forehead. Below the orbits on each side is the antrum, and between them and the septum the ethmoid region. A relative opacity in a sinus of one side as compared with its mate on the other indicates an abnormal condition. A slight density would indicate a hyperemia, a marked difference an empyema. In empyema of the frontal the sinus may be entirely lost from view so that it appears to be absent.

A lateral plate of the head shows the length and depth of the frontal sinuses, the region of the sphenoidal sinuses, the sella turcica, and the alveolar processes. The teeth show distinctly, and disease of their roots or unerupted teeth may be discovered. These are often important in connection with the floor of the antrum.

CHAPTER II

CLINICAL HISTORY

HAVING mastered the technique of examination of the nose and throat, the student should notice the variations in shape, size and color in normal cases, so that he may be able to tell normal from pathologic structures. The color of the mucous membrane may vary in different individuals, or within a short space of time in the same individual, and still be within normal limits. It is seldom that we see a symmetrical septum. A certain amount of adenoid tissue can be seen in children and often in young adults. Is the deviating septum or the adenoid or anything else that we can see the cause of the symptoms of which the patient complains or must we seek farther? In order to judge properly it is often more important to get the patient's story than to examine him. Before examining a patient a physician should ask certain questions and bear the important points in mind during the examination. In the first place he should always remember the patient's reasons for consulting him. Forgetting them he may be induced to devote too much attention to the most obvious abnormality, which may have nothing to do with the symptoms. A student will frequently make a diagnosis of enlarged

turbinate or deviation of the septum or congestion of the pharynx in cases in which these conditions are of no practical importance.

In taking notes of a case it must always be remembered that the length of time that symptoms have lasted should be invariably noted whenever any symptoms are recorded. An illogical diagnosis is sometimes made by attributing symptoms of only a few days duration to an abnormality that must have been present for years. It is also important to ask in cases of acute symptoms whether there have been previous similar attacks.

If the patient complains of nasal symptoms the physician should always ask if there is obstruction to breathing and if there is secretion. He should find out whether the obstruction to breathing is on one side only, bilateral, or alternating between the two sides, whether it is constant or periodic, and if the latter under what conditions it is present.

Secretion may be blown from the nose anteriorly or drop from the posterior nares into the pharynx. The physician should ask whether the anterior secretion is unilateral or bilateral, whether it is watery or purulent, whether it is frequent or occasional, whether it is accompanied by sneezing or by any localized pain.

Post-nasal secretion dropping into the pharynx from above, often called catarrh, is a frequent symptom. Although the patient may think that it originates in the nasopharynx, it generally has come through the choanæ from the nasal or accessory cavities. The patient can

seldom tell from his sensations whether it comes from one or from both sides.

When the patient's symptoms point to the pharyngeal cavity, the important questions are those connected with his sensations, pain, soreness in swallowing, tickling, dryness and the like. The character of the sensations, their locality and duration must be considered.

When a patient complains of secretion in the pharynx it generally comes from the mouth, the nose, or the trachea. Secretion from below the larynx is often raised into the pharynx by a simple act of "clearing the throat" without actual coughing, but is supposed by the patient to have dropped down from above or to have originated in the pharynx or larynx. Its bronchial origin can sometimes be proved by seeing it in the laryngeal mirror on the tracheal wall.

Sensations of a tickling nature may excite either spasmodic or hacking cough. This tickling is often difficult to locate and is more frequently in the larynx than in the pharynx.

Symptoms due to trouble in the larynx are hoarseness of voice, and sensations of irritation often accompanied by cough. The duration of the hoarseness should be noted whether it is constant, whether it came on suddenly or slowly, and whether it is increasing.

Laryngeal obstruction produces noisy inspiration and if the obstruction is sufficient, dyspnea. The peculiar sound of subglottic swelling is known as croup, and is

often accompanied by spasmodic dyspnea, which is entirely relieved when the spasm has passed. It should be remembered that acute dyspnea especially in children may be due to laryngeal diphtheria.

The following summary, while admitting of many exceptions, briefly indicates some of the common symptoms met with in clinical histories and the lesions which may be suspected as the cause of these symptoms.

NASAL OBSTRUCTION AND SECRETION

Periodic obstruction suggests a functional disturbance of the turbinates.

Purulent secretion indicates some form of infection. Watery secretion may be caused by a local irritation, vasomotor rhinitis, reflex neurosis or hydrorrhea, but the irritation may be due to an infection, as in the early stage of a cold in the head.

Constant unilateral obstruction without secretion suggests a deviation of the septum.

Bilateral obstruction without secretion, in the absence of any other obvious mechanical cause, suggests that the turbinates are at fault. With purulent secretion, that the trouble is an infection and the turbinates only secondarily engorged. With chronic or periodic watery secretion, vasomotor rhinitis, with or without polypi.

Unilateral purulent secretion with or without obstruction indicates an empyema of an accessory sinus, or sometimes in children a foreign body.

Chronic bilateral obstruction without secretion, in children, suggests adenoids.

HOARSENESS

Hoarseness is always due to some impairment of the vocal cords. If the voice is alternately clear and muffled it is probable that secretion from below lodges on the cords and impedes their vibration.

If the hoarseness is constant, it is probably due to some inflammation, neurosis, infiltration or tumor affecting the cords, the cause of which can be seen if it is possible to see the larynx.

Increasing hoarseness and noisy breathing of some weeks duration in infants and children suggests laryngeal papilloma.

If acute—laryngeal diphtheria.

If acute, spasmodic, and transitory—croup.

Chronic increasing hoarseness in the absence of tuberculosis and syphilis, especially in elderly men suggests intrinsic cancer.

COUGH

If accompanied by secretion the cause is probably in the bronchi, even if nothing is heard by auscultation.

If paroxysmal and without secretion it is generally reflex from irritation in the larynx or trachea, occasionally from some other region.

If hacking with slight secretion it is generally from some cause below the larynx. If without secretion it is probably

from irritation in the larynx or pharynx, but it may be a reflex from the nose, ear or other part. If the sensation of tickling is unilateral, the region of the tonsil is to be suspected.

A jerky, dry, hacking cough without secretion in children may be a symptom of chorea.

OBSTRUCTION TO BREATHING

This may be due to any obstruction in any part of the respiratory tract. If it is in the nose or nasopharynx it causes mouth breathing. If it is in the pharynx, larynx, trachea or lungs it causes at first noisy breathing and later dyspnea. The character of the sounds will often to the experienced ear indicate the location of the obstruction.

When the dyspnea is mostly on inspiration the obstruction is probably in or above the larynx, when it is on expiration it is probably in the trachea or bronchi.

The more common causes of obstruction in addition to foreign bodies and trauma, are:

In the pharynx, retropharyngeal abscess.

In the larynx, if acute, spasmodic and transitory, croup.

If more prolonged, diphtheria or some virulent infection.

If chronic in children, papilloma; in adults, tabes, local syphilis, tuberculosis, or neoplasm.

In the trachea, in children the thymus or a lymphatic gland, in adults the pressure of some tumor.

In the bronchi, asthma.

PAIN

Pain varies much in different cases and may be located at a distance from the lesion that causes it.

Pain on one side of the face suggests inflammation in an accessory sinus or a tooth.

If acute, supraorbital, diurnal and accompanied by tenderness of the inner wall of the orbit, it suggests an acute frontal sinusitis.

If around and back of the eye, an acute sphenoidal sinusitis.

Tenderness of the cheek may be from the antrum, but it is much more frequently dental.

There is often absence of pain in chronic disease of an accessory cavity.

Headache caused by sinusitis is generally more pronounced on one side than the other.

Acute unilateral pain in the pharynx on swallowing suggests peritonsillar abscess.

Unilateral pricking sensation on swallowing suggests a foreign body in the tonsil.

Indefinite pain about the larynx may be due to neuritis of the superior laryngeal nerve.

CHAPTER III

ANATOMY AND PHYSIOLOGY OF THE NOSE

THE EXTERNAL NOSE

THE external nose forms a cover for the nasal cavities and contains a protected air chamber, the nasal vestibule. The frame-work is of bone above, and of cartilage below. The bony frame-work is made by the nasal bones and the nasal processes of the superior maxillæ. Together these form an arch of bone capable of resisting considerable force in spite of the fact that the bones are frequently thin. Additional support is given by the septum, which is united with the nasal bones in the median line. The frame-work of the cartilaginous portion is made by the quadrangular cartilage of the septum in the median line, and by the upper and lower lateral cartilages on each side. The nasal vestibules are prevented from collapsing during inspiration by the roughly semicircular lower lateral or alar cartilages.

The Profile.—Viewed in profile the forward projection of the nose varies considerably at different ages, in different races, families and individuals, and may be influenced by disease. At birth and during infancy it extends forward very slightly. As the child gets older, the septum grows forward increasing the angle between the perpendicular

line of the face and the nasal dorsum. This forward growth is not regular, its maximum taking place between the time of the second dentition and puberty, being much more marked in the white race, and in some nationalities and families than in others. The negro shows very little

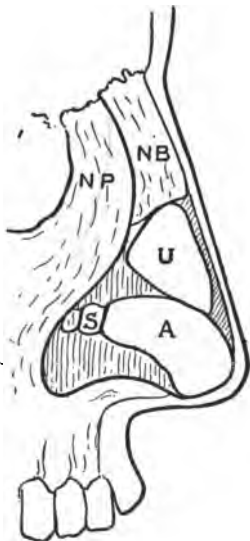


FIG. 8.—The lateral cartilages of the nose. U, Upper lateral cartilage; A, Alar cartilage; S, Sesamoid cartilages; NB, Nasal bone; NP, Nasal process of the maxilla.

of this forward growth, his nasal profile may be said to be a persistence of the infantile type. A similar lack of forward growth occurs pathologically in cases of atrophic rhinitis beginning in early life.

If the forward projection of the nose is slight, the tip which is supported by the alar cartilages will be broad and

the nostrils round and patent. The larger the nose, the more will the anterior parts of the alar cartilages be pulled forward making the vestibule and nostrils longer and narrower. Prominent noses more frequently deviate from a straight line than smaller ones.

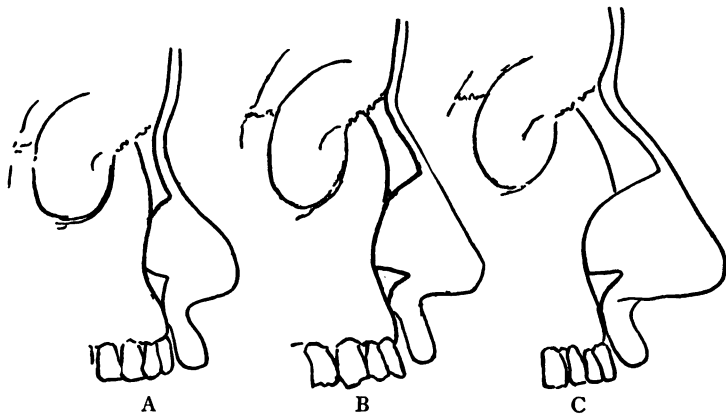


FIG. 9.—Diagrams showing variations in the profile due to the varying extent of forward growth of the septum. A, Persistence of the infantile type; B, Normal adult profile; C, A large nose.

THE NASAL VESTIBULES

The nasal vestibules lie between the alæ nasi and the septum, their lower margins forming the nostrils. Posteriorly they open into the nasal cavities. Their inner surfaces are supported by the septal cartilage and their outer by the upper and lower lateral and a few sesamoid cartilages. These cartilages are subcutaneous to the alæ and give the stiffness necessary to hold the vestibules open. Numerous small muscles move the alæ and change the size and shape of the nostrils. The cavity of the vestibule

is divided into an upper and lower portion by the *plica vestibuli*, formed by the lower margin of the upper lateral cartilage. The upper part is lined with mucous membrane, the lower with skin. From the latter project several thick hairs, the vibrissæ, the follicles of which are deeply imbedded. This portion of the vestibule is subject to those diseases which affect the skin elsewhere.

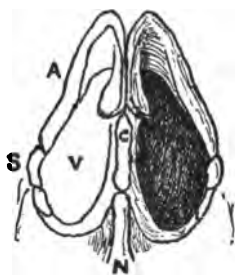


FIG. 10.—Frame of the nasal vestibules. A, Alar cartilage; S, Sesamoid cartilages; C, Septal cartilage; V, Vestibule; N, Nasal spine.

THE NASAL SEPTUM

The nasal septum is a plate formed by the vomer, the perpendicular plate of the ethmoid, and the triangular or quadrangular septal cartilage. It is attached above to the ethmoid, below to the maxillæ and palate bones, anteriorly to the frontal and nasal bones, and posteriorly to the sphenoid. The lower anterior angle has no bony attachment. The lower posterior edge formed by the vomer is free, separating the choanæ. Between the vomer and the perpendicular plate of the ethmoid, a prolongation of the cartilage called the caudal extension, often runs a greater or

less distance along the suture. The vomer is supported by the nasal crest of the maxillæ. Its anterior angle fits into the nasal spine in the region in which are fused together the prevomal bones and the premaxilla, and they all receive the lower border of the septal cartilage. The anterior

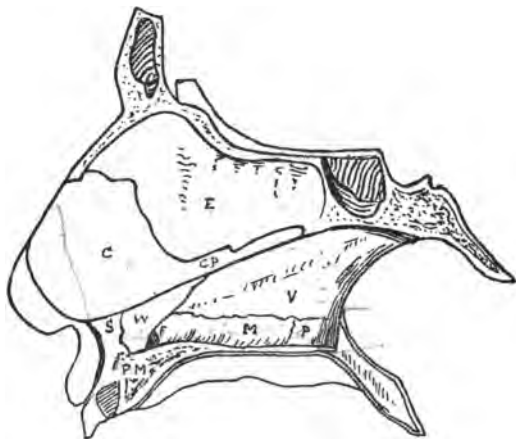


FIG. 11.—The adult septum (Mosher). E, Perpendicular plate of the ethmoid; C, Septal cartilage; CP, Caudal Prolongation; V, Vomer; PM, Premaxilla; S, Nasal spine; W, Premaxillary wing; F, Anterior palatine foramen; M, Crest of superior maxilla; P, Crest of palate bone.

border of the vomer separates into two laminæ or wings, which receive between them the lower edge of the septal cartilage. Abnormal growth of these laminæ produces bony spurs and ridges often seen on deviating septa. There is also often a ridge along the ethmoid cartilage suture.

THE NASAL CAVITIES

The two nasal cavities, separated from each other by the septum, occupy the space between the hard palate below and

the cribriform plate above, and between the external nose in front and the nasopharynx and sphenoid behind. Externally, they are in relation with the antrum and ethmoid cells. The cavity is divided by the middle and lower turbinate bodies into the superior, middle and inferior

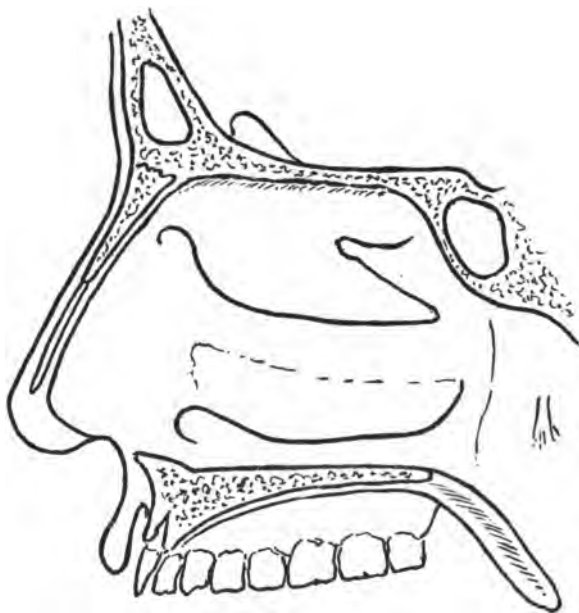


FIG. 12.—The lateral wall of the nasal cavity showing the position of the turbinates and the opening of the Eustachian tube.

meatus. Anteriorly, the entrance into the cavity is through the vestibule and under the bony arch made by the free edges of the nasal bones and nasal processes of the superior maxillæ. Posteriorly, they communicate with the pharyngeal cavity through the *choanæ*, oval openings formed by the vomer,

sphenoid and palate bones. Externally, the lower half of each cavity is separated from the maxillary antrum by the nasoantral wall, a thin partition of bone upon which is placed the inferior turbinate bone. The upper half of the external wall is separated from the orbit by the ethmoid

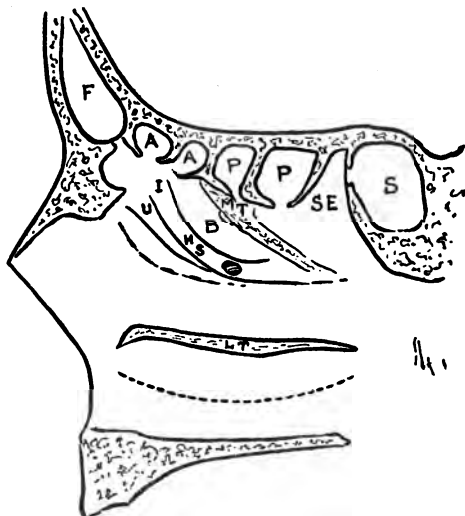


FIG. 13.—Longitudinal section of the nasal cavity through the attachment of the turbinates. F, Frontal sinus; A, Anterior ethmoid cell; P, Posterior ethmoid cell; S, Sphenoidal sinus; B, Bulla; I, Infundibulum; HS, Hiatus semilunaris; U, Uncinate process; SE, Sphenothmoidal recess; MT, Attachment of the middle turbinate; LT, Attachment of the lower turbinate.

cells, which impinge upon the nasal cavity. The middle and superior turbinate are parts of the ethmoid bone, the latter often rudimentary only. Upon the external wall of the middle meatus, covered by the anterior portion of the middle turbinate, is a rounded projection, the bulla eth-

moidalis, below this is a ridge, the uncinatè process, and between the two a furrow, the hiatus semilunaris, which curving around the lower margin of the bulla extends upward and forward forming the infundibulum, into which opens the nasofrontal duct from the frontal sinus, and a varying number of anterior ethmoid cells. Other anterior cells open directly into the middle meatus. The ostium of the maxillary antrum is in the posterior part of the hiatus semilunaris. The posterior ethmoid cells and the sphenoidal sinus open above the middle turbinate into the superior meatus.

The turbinate bodies, of which only the lower and middle are of practical importance, are composed largely of erectile tissue, placed upon a thin plate of bone and covered with mucous membrane. The erectile tissue regulates the width of the respiratory meati, or slits between the turbinates and the septum.

The nasal cavities are lined with mucous membrane, which is covered with columnar ciliated epithelium, and contains serous and mucous glands.

The olfactory nerves descend through the cribriform plate and are distributed over the surface of the septum and external wall as far downward as the middle turbinate, so that the superior meatus only has any olfactory function.

THE ACCESSORY SINUSES

The nasal accessory sinuses are air spaces enclosed within the bones of the face and communicating with the nasal

cavities by small openings. They appear first in fetal life as flask-shaped pits of nasal mucous membrane pushing their way into the ethmoid bone. They continue to develop until the skull has reached its final shape in

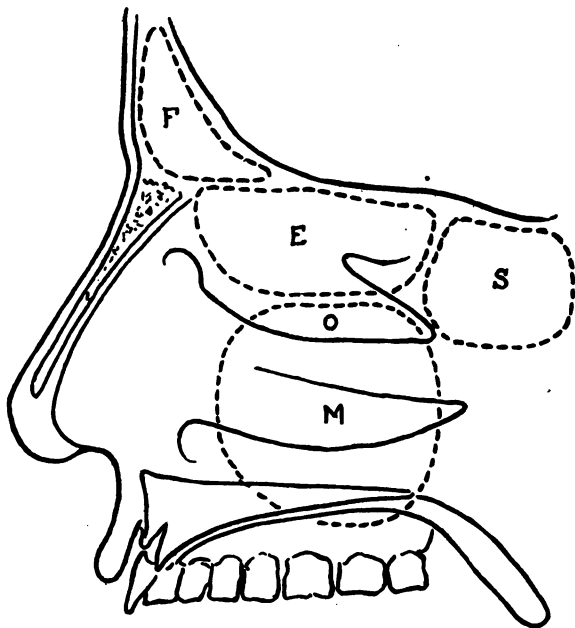


FIG. 14.—Diagram showing approximately the regions of the accessory sinuses projected on a longitudinal section of the right nasal cavity. F, Frontal sinus; E, Ethmoidal cells; S, Sphenoidal sinus; M, Maxillary antrum; O, Ostium maxillare.

adolescence. Some of these cells extend into neighboring bones, ultimately forming the frontal, maxillary and sphenoidal sinuses, the others group themselves into the anterior and posterior ethmoid cells. The ostium by which

each sinus or cell communicates with the nasal fossæ always persists. The accessory cavities vary much in shape and size in different individuals, and even sometimes on the two sides of the face, but they never in developing unite one with the other nor open out anywhere by any other outlet than their original ostia, except when partitions are broken down pathologically.

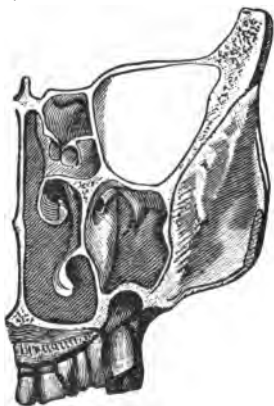


FIG. 15.—Horizontal section through the antrum, behind the ostium (Mosher).

The accessory sinuses' are divided into two groups, anterior and posterior. The anterior group, the maxillary antrum, the frontal sinus, and the anterior ethmoid cells open under the middle turbinate, while the posterior group, the posterior ethmoid cells and the sphenoidal sinus open into the superior meatus. In their normal condition they are filled with air which is in communication through their openings with the air in the nasal cavities. They are lined with mucous membrane a reflexion of that

of the nose. This is closely attached to the bone, and inseparable from the periosteum.

The **maxillary sinus**, or **antrum of Highmore**, is situated in the body of the superior maxillary bone. It is separated from the external nasal wall by a thin, bony partition upon which is placed the lower turbinate. The sinus is in close relation to the orbit above, to the cheek externally at the canine fossa, to the ethmoid cells, and occasionally to the sphenoidal sinus internally, and projects downward more or less into the alveolar process, reaching nearly to the roots of the molar teeth. Its ostium is in the posterior part of the hiatus semilunaris, under the middle turbinate.

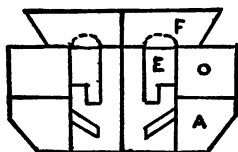


FIG. 16.—Diagram to show the relationships of the frontal sinus (Mosher). F, Frontal sinus; E, Ethmoid labyrinth; O, Orbit; A, Antrum.

The **frontal sinuses** push up from below into the frontal bone, separating for a shorter or longer distance the external and internal plates. The cavities vary much in size in different skulls, and one is often larger than the other, crossing the median line into the region of its mate, but there is normally always a partition between the two. They cover the anterior part of the roof of the orbit, and open into the middle meatus of the nose through the nasofrontal duct. The frontal sinus is an extension of an ethmoid

cell, but not always the same one, so that the relation of the nasofrontal duct to the other ethmoid cells and the infundibulum varies in different skulls.

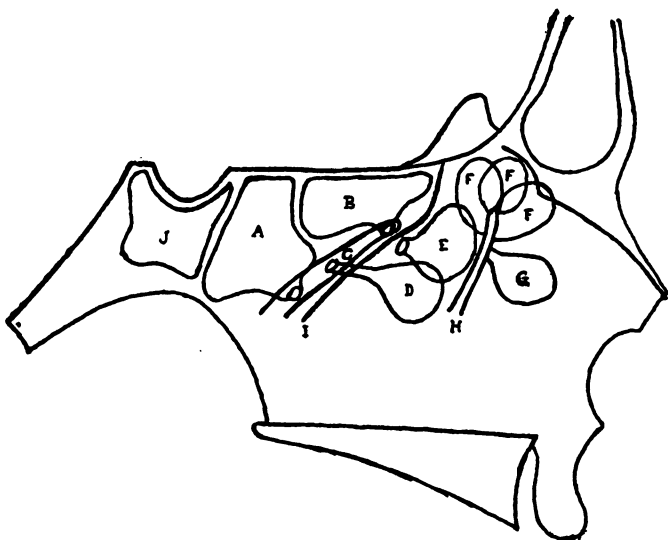


FIG. 17.—Diagram of the arrangement of the ethmoidal cells (Mosher). A, Posterior ethmoid cell; B, Posterior ethmoid cell; C, Third meatus; D, Lower cell of ethmoidal bulla; E, Upper cell of ethmoidal bulla; F, Cells of the upper part of the unciform groove; G, Agger nasi cell; H, Unciform groove; I, Attachment of middle turbinate; J, Sphenoidal sinus.

The **ethmoid cells** fill the space between the upper portion of the nasal cavity and the orbit, from which they are separated by the os planum, the outer surface of the lateral mass of the ethmoid bone. They are divided into two groups, the anterior and the posterior, the former opening under and the latter above the middle turbinate. They

vary in size and in number in different skulls. The anterior group consists of about six cells, more or less. A few of these, called frontoethmoidal cells, often open into the infundibulum in connection with the nasofrontal duct. One or more may project up into the floor of the frontal sinus or extend behind it over the roof of the orbit. The posterior group may contain but one large cell, but generally two or more. They are in close relation with the sphenoidal sinus behind.

The **sphenoidal sinuses** are situated in the body of the sphenoid bone. They are separated from each other by a thin partition, but as one sinus may encroach upon the other, the partition may not be in the median line. Each sinus opens into the corresponding nasal cavity through its ostium, which is situated near the upper part of the dividing wall, not far from the attachment of the vomer. The upper wall separates the sinus from the cranial cavity.

PHYSIOLOGY OF THE NOSE

In the lower marine animals the nose is developed as an olfactory organ. In air-breathing animals it forms a part of the respiratory tract, and has the function of preparing the air for the lungs, the upper portion only being differentiated as an organ of smell. Both of these functions demand that the air be brought in contact with a large surface of membrane, and thus the development of the turbinates and other intranasal structures serves a double purpose. In those animals which have an acute sense of smell, of which

the dog is a type, the upper part of the cavity is partially separated from the lower or respiratory passage, and the olfactory mucous membrane is of enormous extent, the ethmoidal turbinals are highly developed, much convoluted, and extend into the accessory sinuses. In man the olfactory portion is comparatively simple and is probably to a certain



FIG. 18.—Cross section through the snout of a wolf, showing the high development of the olfactory region (Ingersoll).

extent a retrograde development. The ethmoidal turbinals are reduced to two or three, the accessory sinuses are nearly closed, of doubtful use, and show different partial partitions and grooves which suggest the gradual disappearance of a more complex structure.

The principal function of the nasal organ in man is to warm, moisten and filter the inspired air. The external nose serves as a protection and contains the vestibule to the nasal cavities. The alar muscles to some extent regulate the flow of air by changing the shape of the vestibule. The alar cartilages hold the vestibule open, and prevent the

walls from being drawn inward by the ingoing current. The external openings are directed downward, so that the incoming stream of air enters the nasal cavities in an upward direction and curving through them descends into the pharynx.

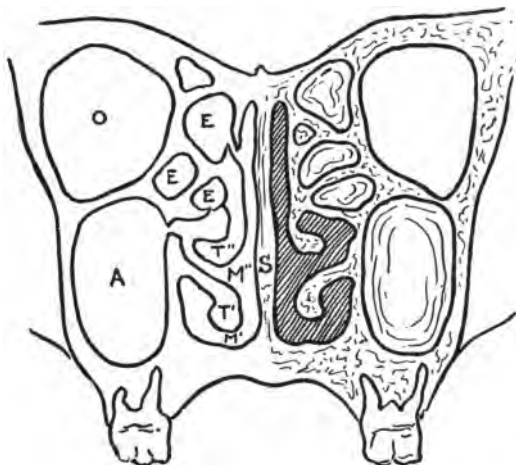


FIG. 19.—Cross section of the nasal and accessory cavities through the second molar teeth. O, Orbit; E, Ethmoid cells; A, Antrum; T', Inferior turbinate; T'', Middle turbinate; M', Inferior meatus; M'', Middle meatus; S, Septum.

A cross section of the nasal chambers shows a long perpendicular slit parallel with the septum, and three meati, separated from each other by the inferior and middle turbinate bones. The latter are covered with erectile tissue, which by swelling diminish the width of the slits or by contracting broaden them, thus regulating the passage of air through the chambers. In order to warm and moisten the air so that it may reach the lungs at body

temperature and saturated with moisture, it must be brought in contact with a large surface of warm and moist mucous membrane. The amount of air required by the lungs varies at different times, less being needed when the body is at rest than when it is at work. The temperature and humidity of the air entering the nose are constantly varying, therefore a fine adjustment must be maintained in the nasal cavities, in order that the air may not get through too fast to be properly warmed and moistened, nor be so obstructed that comfortable breathing is hindered.

The respiratory function of the nose can not be considered essential to life, as many persons habitually breathe through the mouth. Neither is the warming, moistening and cleansing of the air completed by the nose, the other parts of the respiratory tract do much and may have to do all the work. But the nose and not the mouth is the proper breathing organ except in an emergency, and the essential parts of a healthy nasal organ are the respiratory slits, regulated by the turbinated bodies, the supply of moisture, also under accurate control, and the ciliated epithelium.

The nose also acts to a certain extent as a filter to the air passing through it. Coarse particles are stopped by the vibrissæ in the vestibule, others are caught and held by the moist surface of the mucous membrane. In a healthy nasal cavity the surface of the walls is so often found to be nearly sterile that the nasal secretion has been supposed to have a bacteriacidal property. This it probably has not

although it offers poor conditions for bacterial growth. The cleanliness is undoubtedly due largely to the activity of the ciliated epithelium, which ejects impurities into the cavity of the pharynx, and partly to the secretions which under stimulation increase and are either blown out through the vestibule or are drawn backward into the pharynx.

The olfactory part of the nasal cavity is situated above the lower half of the middle turbinate. The olfactory nerves descending from the olfactory bulbs through the cribriform plate are distributed over the mucous membrane of both the septum and the middle turbinates in this region. How these nerves are stimulated is not definitely known. Odors are perceived only when the intranasal air is in motion. They are brought into the nose both from without during inspiration and also from the pharynx and mouth during expiration. In the latter case the impressions are often erroneously thought to be taste. The sense of taste perceives a few crude sensations only, such as salt, sweet, acid, bitter, while all of the aromatic and finer impressions of so-called taste are dependent on the olfactory nerves and are lost when the sense of smell is lost.

PHYSIOLOGY OF THE ACCESSORY SINUSES

These cavities, varying much in size and shape, are found in all animals which have a well-developed skull. In man, these sinuses are less developed than in many of the lower animals. They do not appear to help either the respiratory or the olfactory functions. They are some-

times described as modifying the resonance of the voice. This they undoubtedly incidentally do. If the space occupied by them were solid the sound of the voice would lack resonance.

The best explanation of the economy of the accessory sinuses in man is that they are of value architecturally in the building of the face. A hollow bone is lighter than a solid one. The face contains three sets of cavities which have obvious and very important functions—the single cavity of the mouth, the two nasal cavities and the orbits. The functions of these cavities demand accurate adjustment of certain of their parts, the teeth must fit properly for mastication, the nasal respiratory slits should be of uniform breadth, and the orbits must fit a spherical eyeball. These cavities are so closely packed together that deformity of one tends to deform the others. In the complicated growth of the skull there are several factors which may tend to asymmetry. The accessory sinuses fill in the unused space, making it easier for these cavities to adjust themselves to accidents of development.

CHAPTER IV

DISEASES OF THE EXTERNAL NOSE

FRACTURE OF THE NASAL BONES

THE nasal bones are united with the frontal above, with each other along the median line, with the septum

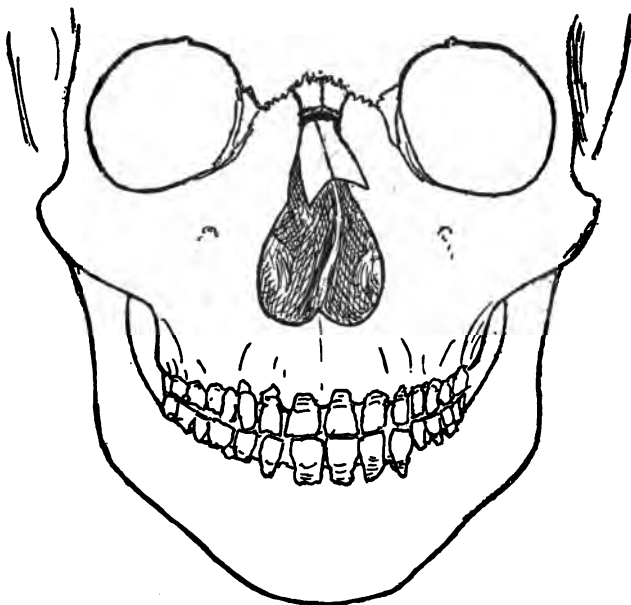


FIG. 20.—Fracture of the nasal bones.

below, and with the nasal process of the superior maxilla on each side. They are comparatively thick above, but

as they approach the free edge below they become broader and thinner; forming with the nasal process an arch which owes its strength more to its shape than to its thickness. The shape of this arch is less suitable for resisting blows

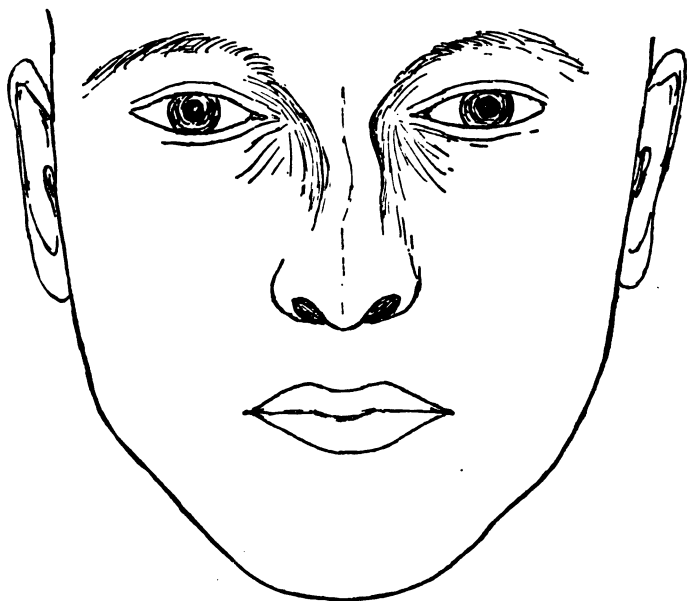


FIG. 21.—Deformity caused by fracture of the nasal bones.

when the nasal bones project markedly, or when they deviate from the middle line. As these bones are united with each other by bony sutures, there is little practical difference between fracture and dislocation, and in fact, in almost all breaks there is a combination of the two. The nasal processes may be involved to a greater or less extent. A blow in the median line is less likely to cause

fracture than a blow on one side and if the bones deviate to one side a blow on the opposite side is especially liable to break them. The injury may be so great that the bones are comminuted, or driven into the nasal cavities, or both, but in the more common fracture the two bones are simply broken across the neck, and either broken or dislocated from the nasal processes. They may be dislocated one from the other, but generally remain in one piece. The bone which received the blow is depressed and caught under the nasal process, while the other bone overrides the nasal process of its own side. The typical deformity due to fracture of the nasal bones is an apparent lateral bowing of the line of the nose as seen from in front. This is because the center of the dorsum has been carried to one side by the dislocation of the bones. The depression of the bone on the concave side adds to the deformity. The nasal bones may be so firmly impacted in this position that no motion nor crepitus is felt and much force against the side of the nose fails to move them. In that case nothing but the lateral deviation is found on examination and the origin even of this may be doubtful on account of the possibility of its being a deviation which existed before the injury. The patient and his friends are sometimes in doubt whether or not the nose is more one sided than before.

One nasal bone only may be fractured and depressed. This is often easily determined by manipulation, the injured bone being movable, sometimes with crepitus, while

the other is fixed and in its proper position. The depressed bone may, however, be firmly held and the depression obscured by swelling. In this case the true condition may be found by internal inspection.

Treatment.—After a fracture or dislocation, it is often impossible to replace the nasal bones in their former position by external manipulation alone. The proper treatment consists in lifting the depressed bone with an elevator passed through the nostril to the under surface of the bone, and at the same time pushing back the overhanging bone by direct pressure. After elevating, it is often possible to reduce the fracture, with very little force, even where before this elevation the bones were practically immovable. A short general anesthetic is in most cases advisable, although in recent fractures not essential. Primary ether or gas may be given, the dislocation reduced and the patient regain full consciousness in a few minutes, thus escaping a short but sometimes severe pain. When once in place the bones often retain their position without splinting. In this case it is better neither to pack nor to put on an external splint, but to see the patient often to be sure that the good position is maintained. The sooner after the injury the patient is seen, the easier it is to replace the bones, and the more likely they are to retain their position without splinting. After the first week, reduction is difficult, and after the second often impossible. If the bones will not retain their position unaided, a splint may be necessary. An external splint should be so made that the line of the

nose and the point of the pressure can be often and readily examined, both to insure the efficacy of the splint and also to prevent a slough.

Instead of an external splint a hollow, hard rubber or soft metal hollow splint introduced into the nasal cavity on the side toward which the nasal bones tend to deviate, may by pressure against the septum hold them in the middle line, or the tip of the nose may be pulled toward the opposite



FIG. 22.—Hollow hard rubber nasal splint (Mayer).

side by a strip of adhesive plaster. Packing should never be put into a nose except to stop bleeding or to act as a splint. Packing by preventing free drainage increases the danger of sepsis. In an unpacked nose the good drainage and the action of the ciliated epithelium give the best possible conditions for healing by first intention. In cases where there is a doubt as to the existence of a recent fracture, if the bones are seen to deviate from the median line, an attempt at reduction should be made. If the nose before the accident deviated to the same side toward which it is dislocated, it is generally impossible to hold it nearer the

middle line than its original shape without increasing the trauma.

If one nasal bone only is fractured and depressed, treatment consists in putting an elevator through the nostril to the under surface of the bone, and pressing it up to the proper position. If it tends to become depressed again the space between it and the septum should be packed. This packing should be renewed every two days for a week or more, until the bone shows no tendency to become depressed.

It is well to remember that all fractures of the nasal bones are compound on their under surface through the mucous membrane which lies next to the bone. Bleeding both at the time of the fracture and of reduction is brisk but seldom troublesome. Sepsis is uncommon even with a compound opening through the skin, but it should be guarded against as far as possible.

A good rule for guidance in the after treatment of a broken nose, applying both to packing and splints, is to do nothing unless you are certain why you do it, and to be sure that what you do is effective. The temptation to do something blindly existed evidently even in the time of Hippocrates, and his advice on the subject is equally wise today. He says:¹

“Those who put great store by a senseless dexterity rejoice to meet with a fracture of the nose in order to apply a bandage. For a day or two the physician takes great

¹ Wright, “The Nose and Throat in the History of Medicine.”

pride in himself, and the patient rejoices, but the latter soon tires of wearing the bandage, which is annoying; as for the doctor it is enough for him to have shown that he understands how to put on various bandages on the nose. Such a bandage does, however, quite the contrary to what is desired; on the one hand, in those in whom the nose has been sunken, it becomes markedly more sunken if pressure is exerted over it; on the other hand, those in whom the nose has been dislocated to the right or to the left, either in the cartilaginous or in the upper part, these evidently, far from deriving any advantage from a bandage placed on it, suffer harm from it."

DEFORMITIES OF THE EXTERNAL NOSE

Lateral Deviations.—Viewed from in front, the line of the nose in a typical face is straight and symmetrical. Frequently, however, as a result of trauma or irregular growth, the nasal dorsum deviates either as a whole or in part from the middle line. These lateral deviations of the external nose may be grouped into three main types.

In the first, the whole nose deviates to one side, the dorsum is straight, there is no angle laterally between the upper bony and lower cartilaginous portions, but the tip is on one side of the median line. This type is due to asymmetrical development.

In the second type the bony upper half deviates to one side, while the cartilaginous lower half tends to return to the median line, causing a lateral angle in the dorsum.

This deformity is the same that occurs with a fracture or dislocation of the nasal bones, and when not due to recent trauma, is generally the result of an old unreduced dislocation.

In the third type, the nasal bones are in the middle line, while the cartilaginous portion is bent to one side. This may be developmental or it may be the result of old trauma of the quadrangular cartilage of the septum from a blow on the tip of the nose modified by subsequent cicatrization.

Two or more of these types of variation may be combined.

When the external nose deviates, there is necessarily also more or less deviation of the nasal septum. In traumatic cases the septum is bent as a result of the external violence. When the asymmetry is due to irregular growth, the deviation of the septum may be the primary cause of the external deviation. With the forward growth of the septum in adolescence it frequently becomes deviated or bent, and the external nose, bony as well as cartilaginous, may follow the septum and adapt itself to the asymmetrical cavities within. This applies not only to the nasal bones, but also to the nasal processes of the superior maxillæ, which, as they are joined to the whole lateral edge of the nasal bones form practically one piece with them.

Treatment.—If the line of the nasal dorsum is straight, it may deviate to a considerable degree from the median line without attracting attention. Therefore, unless it is excessive there is seldom any reason for correcting a deviation of the first type.

The second type is more objectionable in appearance. Here the upper half of the nose deviates to one side while the lower half returns toward the median line, causing an angular bend as seen from in front. To reduce this deformity the nasal bones must be fractured or cut and replaced in the middle line. The nasal bone on the concave side is necessarily broader than the other. To bring the dorsum into the middle line the two sides of the nose must be made of equal width by sliding the edge of the broader nasal bone under the nasal process. This necessarily somewhat lowers the dorsum, or in other words reduces the profile. If there is height to spare the operation is a simple one.

An incision one-eighth of an inch in length is made along the middle of the junction of the nasal bone and the nasal process on each side. Through this a chisel is inserted separating the nasal bones from the nasal processes as high as the neck of the nasal bones. Taking advantage of the mobility of the skin, the chisel is turned at a right angle, and cuts through the neck of the nasal bones. The nasal bones from their necks downward are then freely movable. Upon the broad side the periosteum of the upper edge of the nasal bone and the lower edge of the nasal process is elevated, making a pocket into which the nasal bone is pressed, and held in position by a strap or splint. The incisions are closed without sutures, they heal by first intention and leave no appreciable scar. Enough of the septum must be resected either before or

at the time of operation to correspond to the reduced height of the dorsum.

A nose which is too high and prominent, but straight, may be reduced in height by the same operation, except that the nasal bones on both sides, instead of only one, are pushed under the nasal processes. The bones are so thin that no line along their point of separation shows through the skin.

For the third type of lateral deviation, when the bones are in the middle line but the cartilage is bent to one side, a resection of the cartilage must be done. As little cartilage as possible should be removed, to save the tip of the nose from sinking. Each case presents its own problems which are often difficult, and the results may be endangered by unexpected cicatricial contractions.

Saddle-back Nose.—The nasal dorsum is supported in its upper portion by the nasal bones, below them by the septal cartilage. The tip is also supported by the alar cartilages. If, therefore, the septal cartilage gives way the profile will show a depression between the nasal bones and the tip. Although a nose may be large or small, or at an angle from the median line without attracting attention, a depression in its center even if slight is a disfigurement. This deformity, commonly called saddle-back nose, is generally due to one of two causes, abscess of the septum, resulting in destruction of a portion of the cartilage or syphilitic destruction of the cartilage, the result of gummatous infiltration and necrosis.

Various operations have been devised for correcting it. The introduction of cartilage or bone under the skin to raise the dorsum to the proper height has advantages over other methods. A transverse incision may be made across the neck of the nasal bones, and from this a pocket along the dorsum just under the skin as far toward the tip as necessary. Into this pocket is pushed fresh cartilage or bone in one or more pieces and left in such a position that the depressed part of the skin of the dorsum is elevated to the proper line. Moderate pressure is then applied for a few days. The cartilage or bone may be supplied from a rib, or cartilage from a resection of the septum. The introduction of metal plates under the skin was at one time common, but has now been abandoned.

Paraffin.—The skin may be raised over an unsightly depression by the subcutaneous injection of paraffin. The danger of subsequent hyperplasia about the seat of injection has made this operation less popular than it was a few years ago. The paraffin used has a melting point of not less than 110 degrees Fahrenheit, and is injected cold.

DISEASES OF THE VESTIBULE

The lower portion of the nasal vestibule is lined with skin. Consequently the diseases of this cavity are those of the skin rather than of mucous membrane. In examining the vestibule the anterior parts are best seen by the aid of a small rhinoscopic mirror, held just within the cavity.

Eczema of the Vestibule.—An excoriation within the vestibule is frequently seen and is commonly called eczema. It may be caused by irritation from acrid nasal discharges, or by picking the nose or other trauma. In hospital clinics it is frequently associated in children with *pediculi capitis*. The skin of the vestibule is covered with scales or crusts; it may be fissured and the alæ may become stiff, thickened and tender.

Treatment consists in removing as completely as possible all sources of irritation, especially prohibiting all picking of the nose. An ointment should be applied frequently to prevent drying of the crusts and to protect the surface. One containing boric acid is generally sufficient.

Furunculosis.—The vibrissæ, especially in men, are stiff hairs with deep follicles. If one of these follicles becomes infected the result may be a small abscess or boil. The cause of this infection is sometimes from the wound caused by pulling out a hair, or it may be due to local irritation or to general susceptibility to a particular micro-organism. From any of these causes the furuncles are liable to be multiple or recurrent, or both. These abscesses generally rupture into the vestibule, but sometimes one situated under the ala or tip of the nose extends to the external skin, and opens through it, occasionally discharging with the pus, the hair around the root of which the abscess formed. If the abscess arises on the inner wall of the vestibule the pus may burrow into the connective tissue between the bone and the skin over the whole cheek, and finally rupture or

be opened between the alveolar process and buccal mucous membrane.

Treatment consists in opening any existing abscess, generally through the vestibule, in cleaning the skin of the vestibule with antiseptic, but non-irritating, solutions, and in the application of an ointment to prevent crusts. It is essential that the patient should be absolutely forbidden to pull out any hair. The temptation to remove dried mucus from the vestibule is great, and as this is often attached to one or more of the vibrissæ, the latter may be pulled out almost unconsciously, and an entrance established for the recurrence of the furunculosis.

Recurrent furunculosis may be due in part at least to a diminished resistance of the patient to some definite micro-organism. In a persistent case the micro-organism should be sought for and an autogenous vaccine given.

Lupus.—The vestibule is sometimes invaded by lupus from an extension of the disease from the skin of the face. It may, however, be primary here. The treatment is the same as for lupus of the skin.

Erysipelas.—The vestibule may be the starting point of erysipelas. The infection entering in this way shows itself first in the skin of the dorsum of the nose; in fact, the majority of cases of facial erysipelas have their origin within the nose. The infection is probably originally conveyed to the nose by the fingers. Both prophylaxis and treatment are based upon cleanliness.

Anterior Fissure.—Under this head may be described a

symptom-complex consisting of an inflammation of the anterior portion of the vestibule, with tenderness and often redness and swelling of the tip of the nose, and periodical watery nasal secretion. It may be unilateral, or if bilateral, it is generally more pronounced on one side. This condition lasts for weeks or months and generally results in a small visible fissure extending forward from the anterior margin of the vestibule, which persists after the active process has entirely stopped. The etiology is obscure. It should be treated by a bland ointment, and all irritation avoided.

COLLAPSE OF THE ALÆ

The lower lateral or alar cartilages on horizontal cross section are roughly semicircular, or in the shape of the letter C. The anterior wing rests on the tip of the septal cartilage while the posterior broadens out to form the ala and rests against the maxilla.

When the forward projection of the tip of the nose is slight as in infants, negroes, or persons with small noses, the alar cartilages maintain their semicircular shape, and the nostrils are nearly circular. But when the tip of the nose projects markedly forward in its growth it carries with it the anterior wing of the alar cartilage, which then becomes straightened, and the nostril becomes elongated and more in the shape of a slit. The nostril and vestibule are held open by the resiliency of the alar cartilages aided by the levator labii superioris alaeque nasi muscle. They may fail to do this sufficiently to resist the current of inspired air,

either from lack of elasticity of the cartilage or inertia of the muscle, and this is for obvious mechanical reasons more likely to happen if the nostril is long and narrow than when it is circular. This condition is called collapse of the alæ, and may be a serious annoyance in preventing the patient from drawing air freely into his nose. Different operations have been devised for widening the nostrils but none of them appear to have become established as efficient. A device of bent wire can be obtained which is introduced into the vestibule to hold the ala outward.

CHAPTER V

DISEASES OF THE NASAL SEPTUM

EROSION OF THE SEPTUM

AN erosion of the mucous membrane of the septum is frequently seen just inside the vestibule. This point is especially liable to injury from the finger nail or handkerchief introduced to remove dry mucus or crusts. The tips of atomizers or douches improperly thrust into the nose may cause abrasions. The inspired air may be cold, or dry, or contain irritating substances. The mucous membrane at this point becomes irritated or deprived of its epithelium allowing dry scabs and crusts to become adherent. The ciliated epithelium is destroyed and ultimately replaced by the squamous variety. Or if the injury is deeper the mucous membrane may be destroyed and replaced by cicatricial tissue.

Treatment consists in the avoidance of all irritation or pulling off of crusts, and in the application of a simple ointment to prevent the formation of scabs. If this is insufficient a warm bland wash, such as normal salt solution, may in addition be snuffed up from the palm of the hand. Caustics and irritating applications must never be used.

PERFORATION OF THE SEPTUM

The cartilage of the septum is dependent upon the mucous membrane for its blood supply. Consequently, if areas of mucous membrane on each side and opposite to each other are deeply injured at the same time, a permanent perforation of the septum will result at this point. A circular perforation just inside the vestibule, caused by bilateral traumatic erosion, is not uncommon. Until the epithelium of the two sides unites around the perforation, circular crusts will form around the margin. If these are picked away the perforation will increase in size. After the margin has become healed and crusts no longer form, the hole in the septum may give the patient little or no inconvenience. But a small hole on a bowing septum may cause a whistling sound in breathing. This can be remedied by straightening the septum. A simple traumatic perforation is always confined to the middle of the septal cartilage. It never reaches the vestibule, the dorsum, nor the bony septum. It is to be distinguished from a perforation caused by syphilis which commonly extends to the dorsum, causing the saddle-back deformity, and often includes part of the bony septum.

Treatment.—It is important that the patient should not roughly remove crusts from the border of the perforation. These crusts may be prevented by an ointment and a wash, as in the case of a simple erosion.

Different plastic operations have been devised for closing small perforations with flaps of mucous membrane. This is

in most cases difficult to do and if unsuccessful the attempt increases the size of the original hole.

ABSCESS OF THE SEPTUM

An abscess of the septum arises from infection under the mucous membrane. It occurs much more frequently in children than in adults. Its usual cause is a blow on the nose by which the mucous membrane is torn, and possibly the cartilage fractured. The mucous membrane heals

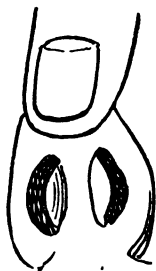


FIG. 23.—Abscess of septum.

quickly, inclosing an infected focus. In some cases there is at first a hematoma, which later becomes an abscess; in other cases the pus starting from a small area dissects the mucous membrane from the septal cartilage over the anterior part of the septum. The abscess is bilateral and the cartilage surrounded by pus is soon destroyed. When this loss of cartilage extends to the anterior edge it weakens the support of the dorsum of the nose, and there ultimately results more or less saddle-back deformity, as has already been described.

The symptoms of abscess are obstruction to breathing, becoming bilateral and complete, and a little tenderness. On inspection the mucous membrane of the septum is seen bulging outward on both sides and occluding the nasal passages. Fluctuation may be felt with a probe.

Treatment.—A free incision should be made and a packing should be placed against as much of the septum as is involved; and the incision kept open to prevent further accumulation of pus. Early diagnosis and treatment are important to prevent subsequent sinking in of the dorsum. This sinking does not appear until the swelling has subsided, and increases during cicatrization.

ULCERATION OF THE SEPTUM

A true ulceration of the septum, as distinguished from a traumatic erosion, shows the presence of some acute or chronic disease. Ulcers may occur in typhoid, glanders, Vincent's angina, scurvy, and other acute infections. More chronic ulcers always suggest syphilis. They may also be due to tuberculosis, lupus, or leprosy.

SEPTAL ADHESIONS

Adhesions between the septum and the lower or middle turbinate are not infrequent. They are formed only when a portion of the mucous membrane of the septum and of the turbinate opposite to it are denuded of their epithelium at the same time. Swelling of the turbinate under these conditions brings the two raw surfaces together, they

readily unite and ultimately form an adhesion, which varies from a narrow band of cicatricial tissue joining the septum and turbinate, to an extensive union of the two. These adhesions are usually due to trauma from operation, foreign body, or picking of the nose. If slight, they may cause no symptoms, if extensive they obstruct respiration.

It is often difficult to get rid of an adhesion, because when cut the two raw surfaces, unless small and separated from each other, tend to reunite. If the adhesion is extensive, a portion of the turbinate or septum may be removed, and the surfaces kept apart until healed. When necessary to use packing, this should be covered with cergile membrane, and changed every two or three days.

DEVIATIONS OF THE NASAL SEPTUM

The nasal septum is formed by the vomer, the perpendicular plate of the ethmoid and the quadrangular septal cartilage. The circumference is held firmly in a bony frame, except where it projects forward to form the external nose, and between the choanæ behind. In a typical skull the septum should be a symmetrical plate in a perpendicular plane, but this is very rarely the case. The tendency to deviate from the median line varies in different races, the negro and primitive tribes showing it to a less degree than the European. Though often seen in children the deviation is much more frequently found after the time of second dentition. After adolescence the septum does not change in shape, or the change is slight, and takes place slowly.

Many theories have been advanced to explain the deviations and excrescences of the septum, and their frequent occurrence. Among these may be mentioned trauma, obstruction to respiration, local inflammatory processes, irregular development of the teeth, or of the accessory sinuses, or of the other parts of the skull. The only

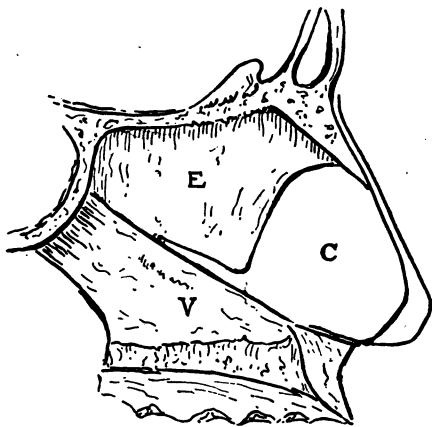


FIG. 24.—The nasal septum. E, Perpendicular plate of the ethmoid; V, Vomer; C, Cartilaginous septum.

important etiological factors are asymmetrical development and trauma. Modern man has as a rule a more or less asymmetrical skull and it is obvious that a thin plate firmly fastened in the center of the skull would be among the first structures to show asymmetry and would be easily affected by irregularities of neighboring structures. If we compare the small septum of the infant with the enlarged septum of the adult it will be seen that nothing

but the most symmetrical growth would maintain it in an exact plane. Blows upon the nose may by transmission cause either displacement, local fracture, or interference with normal development.

Deviations of the septum differ so much one from the other that it is rare to find two exactly alike. There may

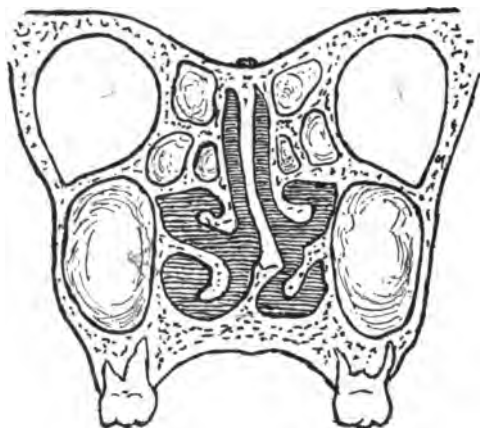


FIG. 25.—Moderate deviation of the septum with corresponding adjustment of the turbinates.

be a simple bending of a large surface, or the bending may be double or sigmoid, there may be sharp angular bends, or excrescences of cartilage or bone, but a careful study will show that they tend to follow certain lines. The junction between the bony and cartilaginous septum is necessarily a line of weakness. The suture between the vomer and cartilage, which runs backward and upward from the nasal spine, is generally the line of the greatest bending. At

right angles to this line the cartilage is also frequently bent between the nasal spine and the nasal bones.

The septal cartilage fits into a bony groove along the top of the vomer, made by a separation of the upper edge of the bone into two bony leaves. One of these bony leaves may have been bent or broken, allowing a local partial dislocation of the lower edge of the cartilage. This results

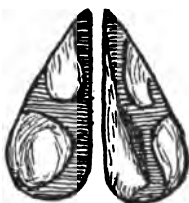


FIG. 26.—Diagram showing a moderate degree of deviation of the septum into the left nasal cavity with corresponding increase in size of the turbinates on the (patient's) right side.

in a spur, which is mostly cartilage, supported by a thin ridge of bone below, representing the bent or broken bony leaf.

It will readily be seen that any bending or bowing of the septum as a whole would be liable to dislocate the cartilage from the bone and throw the dislocated edge toward the convex side forming a spur or ridge along the line of suture. As these changes take place slowly during the process of growth, we find hand in hand with deviations and dislocations changes which are evidently the result of adjustment and repair.

On the concave side of the septum the mucous membrane is sometimes pulled in along the line of disloca-

tion, making a sharp furrow; more frequently it presents a smooth, concave surface. In this side in well-marked cases the wing of the vomer shows as a rounded bony ridge.

Between the ethmoid plate and vomer there is commonly inserted for a greater or less distance a strip of cartilage. A dislocation of this caudal cartilage may make a spur or ridge that is largely cartilaginous. Where the ethmoid plate and vomer come directly together a spur entirely of bone may occur.

Between the ethmoid plate and the cartilage rounded spurs, increased in size by thickening of the mucous membrane, are commonly found.

Sharp bends and thickened angles of the cartilaginous septum, the result of trauma, are not infrequent.

The posterior part of the vomer with its free edge dividing the choanæ is practically always symmetrical.

Pathology.—The respiratory passages in the normal nose are slits between the turbinates and the septum, and between the different turbinates, which slits are generally narrow, but capable of considerable widening by contraction of the turbinates. Looking at a cross section of the nasal cavities it is evident that even a slight bowing of the septum would seriously interfere with the mechanism of the air-carrying passages unless there were a compensating variation in the size and shape of the turbinates. The erectile tissue of the turbinates can and does compensate for a certain amount of irregularity of the septum, enlarging

opposite a concavity and shrinking opposite a convexity, but there is often a compensating change in the size and shape of the bone itself, and even of the ethmoid cells. The whole interior of the nasal chambers in spite of its asymmetrical development is adjusted to maintain the respiratory slits. So well is this done, that unless the deviation is excessive or extends far enough forward to block respiration at the unyielding nasal processes, there may be no obstruction to nasal breathing. Sometimes the patient complains that the wider or concave chamber is more frequently obstructed than the narrow one. This is because it contains more erectile tissue. But if the deviation or the excrescences of the septum are excessive this adjustment is no longer possible, and the patient is aware that the narrow side is obstructed. With most deviations of the septum we can trace a counteracting asymmetrical growth of the structures attempting to minimize the disturbance of function which the deviation would otherwise cause. These correcting asymmetries, especially the turbinates opposite a concave septum, may be more noticeable to casual inspection than the asymmetry of the septum itself.

The nasal processes of the superior maxilla do not take part in this adjustment, consequently a deviation of the septal cartilage which extends forward into the vestibule obstructs respiration on that side more than would an equal degree of deviation farther back. When the deviation extends forward into the vestibule the patient may notice that on one side it is only by drawing the alæ and skin

outward that he gets a satisfactory draught of air through that nostril or he may have acquired the habit of frequently contracting the muscles of that side of his face for the same purpose.

In the majority of cases of deviation extensive enough to produce any symptoms, there is both narrowing at the nasal process and bowing within the nasal chamber, usually on the same side, but the anterior obstruction may

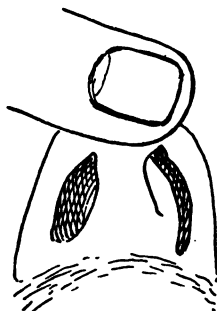


FIG. 27.—Dislocation of the anterior margin of the septal cartilage.

be great with a comparatively straight septum within, or there may be much bowing opposite the turbinates with but little narrowing at the introitus.

The anterior edge of the cartilage is sometimes bent or thrown to one side, either obstructing the vestibule or making an unsightly projection below it.

Symptoms.—The most important symptom of deviations and spurs is obstruction to nasal breathing. This may be unilateral in cases of narrowing at the introitus or of extensive deviation into one nasal chamber. It may be bi-

lateral in cases of complex bending, or if one cavity is considerably narrowed and the compensating enlargement of the turbinates in the other excessive. The obstruction may be periodic only; there being insufficient space except under the best conditions. In this case it is often difficult to judge whether the deviation or some other cause is responsible for the patient's symptoms.

Deviations are often supposed to cause a tendency to or continuance of inflammatory disturbance, acute or chronic rhinitis. This can be partly explained by the interference with proper drainage in a crooked cavity, but in most cases in which deviation and secretion occur together, they have no connection with each other.

Reflex neuroses of various kinds, headache, neuralgia, cough, and asthma, are sometimes referred to a deviation or spur especially if in contact with the middle or lower turbinate, but such contacts are often found which are not causing any symptoms.

A deviating septum may interfere with the proper ventilation of the Eustachian tube and need correction on that account.

It is important to consider carefully the symptoms which may be caused by a deviating septum, in order to judge properly whether an operation for straightening it is to be advised. If the symptoms are due to the deviation they should disappear after the septum has been straightened. The most important symptom is nasal obstruction, but nasal obstruction may be due to other causes.

When the patient's symptoms are varying, or periodic, or indefinite, too much should not be promised from the operation. Straight nasal cavities are better than crooked ones, but unless the deformity is the cause of symptoms,

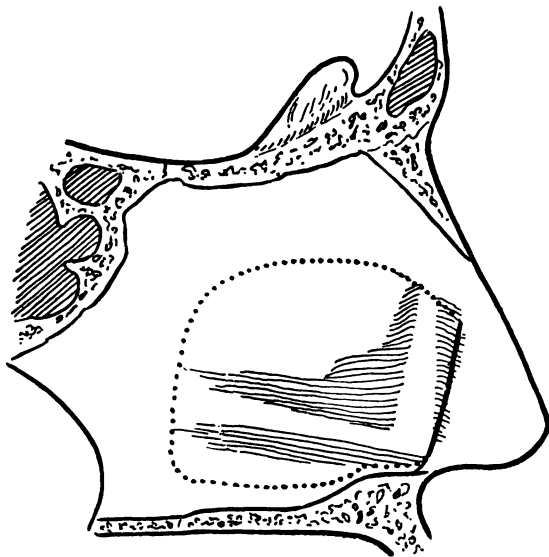


FIG. 28.—Diagram of a septum showing position of deflection, the incision through the mucous membrane on the convex side, and the area from which the cartilage and bone is removed by submucous resection.

the patient will not notice any benefit from an operation and may criticise the operator for having undertaken it. In brief it may be said that obvious unilateral obstruction corresponding with the deviation is good reason for operating. Also that in a nose with periodic or alternating obstruction, provided that the symptoms are chronic and

that no other good cause can be found to account for them, a marked deviation should be corrected. If the patient has also chronic or periodic nasal secretion, the obstruction may be due to some other cause than the deviation and may not be relieved by straightening the septum. When the symptoms are other than obstructive, such as secretion, neuralgia, hay fever or asthma, it should be explained to the patient that any operation is experimental.

Treatment.—The correction of deviations and spurs of the septum is necessarily surgical. No manipulation nor mechanical appliances have been found effective. Of the numerous operations for straightening the septum the so-called submucous resection has largely superseded the others.

The **submucous resection** originated with Krieg about twenty years ago, but it attracted little attention at the time. He dissected out the bowing cartilage leaving the mucous membrane of the concave side intact. In more recent years the operation was revived, and various modifications and instruments introduced, by Bonninghaus, Peterson, Hartmann, Killian, Ballenger, Freer, and others. The details of the operation and the instruments vary with different operators. The important steps in the operation are as follows: The vibrissæ are cut away and the vestibules are carefully cleaned, both sides of the septum over the area of deflection are cocaineized and blanched with adrenalin. A perpendicular incision through the mucous membrane to the cartilage is made on the obstructed or

convex side, in front of the deflection. Through this incision, the mucous membrane on this side is separated from the underlying cartilage and bone over the whole deflection. The mucous membrane can generally be easily detached by blunt dissection except in the vicinity of the suture of the cartilage and bone, where careful dissection with a sharp knife may be necessary.

A vertical incision is then made through the cartilage in front of the deflection, care being taken not to perforate the mucous membrane on the concave side. By working through this slit in the cartilage the mucous membrane on the concave side is then separated in a manner similar to that on the convex side. This leaves as much of the septum as is to be removed denuded of its mucous membrane on both sides, that on the concave side being intact. The two layers of mucous membrane are held away from the denuded cartilage and bone by a speculum with long blades. The cartilage to be removed is then cut through above and below and at its farther extremity with a specially devised knife and taken out. It is not necessary that the cartilage should be in one piece, the remaining portions can be cut away or punched out with biting forceps. As much of the bony septum as is necessary to get a good result is then removed with biting forceps or chisel. The base of the deviation usually projects upward and outward as a thick bony ledge which requires special care in its removal. Having removed the deviating cartilage and bone, the nasal cavities are packed. This holds the mucous membrane of

the two sides together and prevents bleeding. The packing may be removed in a few hours from the concave side and in a day or two from the other. Healing should be by first intention.

The advantages of this operation are its accuracy and certainty if well performed, the lack of necessity for a general anesthetic and for splints and lengthy after-treatment. It requires careful and sometimes prolonged dissection, the time required is sometimes long, and the technique demands patience as well as accuracy and experience. For many children and a few nervous adults a general anesthetic is necessary.

The question often arises whether this operation should be done on a child whose nose has not yet approached adult size. The removal of the cartilage may prevent proper development of the external nose, resulting in a drooping or flattened profile, although this deformity does not always occur. In general it may be said that if the obstruction to breathing is not serious, the operation should be postponed until the nose has sufficiently developed, but if the child is suffering from the nasal obstruction, the septum should be straightened even at the risk of retarding the development of the external nose.

When an extreme deviation of the septum has been compensated for by enlargement of the turbinates into the concavity, it may be necessary to remove part of these turbinates at the time of or before the septum operation. The small turbinates of the convex side seldom fail to in-

crease to the proper size after the space between them and the septum has been enlarged. The large turbinates of the concave side if composed mostly of soft tissues will also probably accommodate themselves to the new conditions after operation. If the turbinate bone itself projects too far toward the median line it should be either partially removed, or if possible fractured and placed toward the external wall.

Other Operations.—Among the older operations which are now seldom used may be mentioned the following: A projecting spur may be simply sawed off with a narrow saw. This method has the advantage of simplicity. It is, of course, applicable only for spurs and ridges and useless for a thin, deviating septum. The saw is kept as near the median plane as possible, without perforating the septum or injuring an unwarranted amount of mucous membrane. As a certain amount of mucous membrane is removed there will be a surface left to granulate, which rarely, however, gives the patient any discomfort. This raw surface may be avoided by dissecting out the spur submucously.

Operations for deviations based upon cutting the septum so as to make definite flaps which can be re-adjusted in the median line include those of Asch, Watson, and Gleason.

The *Asch operation* is done by making two oblique incisions through the deviating septum, an inch in length, the two crossing each other as in the letter X, thus forming four pointed flaps. With the finger in the obstructed side each flap is pushed into the concave side and bent with

force enough to destroy the elasticity of the cartilage along its base, or if bone to break it. The septum is then brought as nearly as possible into line with special forceps and a splint consisting of a hollow rubber tube is put into the previously obstructed side. This may be removed to be cleaned, but must be worn until the parts are united, which will be in a few weeks. The operation is rough, uncertain and not applicable to many forms of deviation. A general anesthetic is necessary.

The Operations of Watson and Gleason.—These differ from each other in the shape of the flap. A saw is inserted on the obstructed side below the deviation and made to cut at first horizontally and then nearly vertically upward going through into the concavity of the opposite side. The incision is continued upward until a flap has been made, including a large part of the deflection. On account of the beveling of the edges thus made the cut will be smaller on the concave than on the convex surface of the septum. The flap is pushed forcibly through into the concave side where on account of the beveled edges it holds itself in place. Packing or a splint should be put into the previously obstructed side, but if the flap is well held in its new position this may be removed in a few days. This operation may be done with cocaine. It is especially applicable to vertical deflections of the cartilage.

A similar operation may be done by one oblique cut with the saw, entering just under the projecting spur on the convex side and cutting obliquely upward into the other

cavity along the line of the vomer cartilage suture, separating the cartilage from its bony attachments below. The whole cartilage then becomes a flap which can be pushed into the concave side, and be held along its whole lower border. The mucous membrane should be denuded where the two surfaces lie together in the new position. Deviations of the bone are fractured and held in the median line.

EPISTAXIS

Bleeding from the nose occurs more frequently than from other parts of the body. *In the vast majority of cases the bleeding comes from a comparatively limited area on the anterior part of the cartilaginous septum.* This is true both of those cases in which it is due to purely local causes, and of those in which it is secondary to some constitutional trouble. This region is known as *Kiesselbach's area*. The reason that it bleeds so easily is found in the distribution of its vessels. A thin plate of cartilage is covered on each side by mucous membrane and it is imperative that this membrane, in common with the rest of the lining of the nasal chambers, should have an abundant blood supply. As the arteries are in the mucous membrane they are necessarily superficial, liable to injury, and incapable of retracting into deeper tissues after being ruptured. If for any reason an artery is defective it may give way with an increase of blood tension. Bleeding from the veins or capillaries is rare and is generally slight in amount and of short duration. Epistaxis unless due to trauma is apt to be re-

current, either because the same artery is insufficiently occluded, or because other arteries are ruptured by the same conditions, either local or general. The local conditions which lead to recurring nose-bleed are the erosions and crust formations previously described, and the rupture of exposed arteries in a thin mucous membrane, as frequently seen in children. The constitutional conditions favoring epistaxis are those in which the vessels are defective, clotting of blood retarded or tension increased, such as arteriosclerosis, anemia, and typhoid fever.

Epistaxis may of course be post-operative, in which case the seat of operation is the probable source of the blood. It may also arise from angioma or other new growths or from ulceration due to syphilis, tuberculosis, or a foreign body, in which case it may come from any part of the nasal cavity, although more commonly from the nasal septum.

If the bleeding is from its usual place on the septum, with the head held forward the blood flows out through the nostril unless this is obstructed; with the head held back it flows into the pharynx.

Treatment.—If the bleeding is slight no treatment may be required. Snuffing up of cold or astringent solutions is to be discouraged. The knowledge that the blood probably comes from the anterior part of the cartilaginous septum directs attention first to this area. Firm pressure externally of the ala backward and inward with the finger will often compress the bleeding artery against the bone or cartilage and stop the bleeding. If this is insufficient a

plug of cotton should be packed against the bleeding area. If possible the patient should be seated as for examination of the nose, the light and head-mirror adjusted and the ala held open with the nasal speculum. If the bleeding-point can be seen, a plug of cotton is packed against it tightly enough to stop the bleeding and allowed to remain in place. If the blood is coming too fast to see its source, a firm packing of a strip of gauze or compressed cotton should be carefully put in, sufficient to press against the anterior and lower part of the septum. If in spite of this, blood flows freely into the pharynx the packing should be removed, the whole nasal cavity cleared of clots and packed firmly. This is best done by laying a strip of gauze or roll of absorbent cotton along the floor of the nose, care being taken that it is not long enough to hang down into the nasopharynx. This strip should be firmly pressed downward with the nasal forceps, and a second strip or roll placed above and pressed down onto the first one. Successive strips are then put in, building the packing up from the bottom until the cavity has been filled up to the level of the middle turbinate. If necessary the superior meatus may also be filled by packing a strip of gauze or piece of cotton into it. It is seldom necessary or advisable to use any styptic with the packing. The packing material should be sterile if possible, and may be impregnated with an un-irritating antiseptic. In removing the packing the strips are taken out in the reverse order to that in which they were put in.

If there is still bleeding into the pharynx it may be necessary to remove the packing and to plug the posterior nares. This is done by passing a string through the bleeding side with the help of a Belloc sound, a stiff cord, or a flexible bougie, seizing the string in the pharynx, bringing it out at the mouth and tying it to a gauze sponge small enough to enter the nasopharynx, but too large to be drawn through the choana. The other end of the string is then drawn out at the nose and the sponge carried into the nasopharynx and firmly drawn against the posterior nares. The nasal cavity is then packed through the nostril. This disagreeable operation can generally be avoided by skill and care in packing from in front.

In case the epistaxis is seen to come from a certain artery, or in any case if it occurs often, an attempt should be made to prevent its recurrence. The bleeding having stopped, the septum should be carefully searched for the offending vessel. If it is found, the area around it should be carefully dried, and a small bead of chromic acid (chromium trioxide) put upon it, taking care that the caustic is confined to the vessel and its vicinity. This is left on for a few minutes, and the excess removed, leaving an eschar with the vessel in the center. If the vessel is a large one it is well to touch it with a galvanocautery point, heated gently so that it will not adhere, or with a probe heated in a flame. Suspicious spots may be treated in this way, taking care not to cover more than a small surface at a time, and not to attack both sides of the sep-

tum at once, for fear of causing perforation. The eschars remain for a week or more, and the vessel in the meantime is permanently closed. If the recurrent bleeding is slight and comes in connection with erosions and crusts, it is better to treat the underlying trouble with ointments and not to cauterize. Extensive cauterization is never to be recommended. The sole object in cauterizing is to bind the bleeding artery into the eschar.

CHAPTER VI

DISEASES OF THE NASAL CAVITIES

It is difficult to classify accurately those disturbances which are popularly called colds, or in medical language rhinitis, pharyngitis, and laryngitis in their different forms. An exact classification by regions or by etiology is not possible, because many of them are not limited to one region, and their etiology is often uncertain. Although the symptoms may be similar, they include different pathological processes. Some of them have a fairly definite symptom-complex, others cannot easily be distinguished one from another. They are perhaps the most frequent complaints with which a physician has to deal. They may be divided into acute and chronic, although a sharp line can not always be drawn between the two.

ACUTE RHINITIS

In order to classify the different acute processes which are commonly known as rhinitis, we may begin by dividing them, according to their etiology, into two groups, infectious and non-infectious, both of which may be either local or systemic. The infectious forms are caused by the invasion of micro-organisms. Some of these are well known, as the bacillus of diphtheria; others have not been differentiated. The rhinitis may be part of a systemic

infection, as in measles. In the non-infectious forms the local irritation may be caused by a simple irritant present in the inspired air, or by one of a group of substances to which the victim has a special intolerance, as in hay fever. The systemic cause may be chemical, as in the case of the coryza due to iodide of potash. The symptoms may be due to a nervous reflex or circulatory disturbance.

Treatment and prophylaxis if based on mistaken etiology and pathology are likely to be defective. It is, therefore, desirable as far as possible to classify various forms of rhinitis and especially to distinguish infections from local or systemic irritations. In some cases both of these etiological factors may exist, and it is often disputed whether contagion or exposure to weather is the cause of the trouble.

COLDS

The word "cold," although not justifiable from the point of view of any scientific nomenclature, is so established that no protest from scientific medicine will prevent its use. It has incidentally one advantage over such terms as rhinitis, pharyngitis, laryngitis and the like in that it can be applied to more than one region without changing its name. It is often used to include all acute and subacute affections of the upper respiratory tract which can not be described under some more definite pathological heading. But there is one form or "symptom-complex" so common and constant, that it might well be classed as a distinct and definite disease, and it is to this disease that the word

"cold" is most frequently applied. Briefly, these symptoms are as follows: The patient first notices a localized irritation, frequently in the nasopharynx, occasionally in the larynx, nose or pharynx. During the next few hours or days this inflammation spreads by direct extension to neighboring regions. It may involve the nose, the accessory sinuses, the pharynx, the larynx, the trachea and the bronchi, but it may stop before reaching all of these parts. On examination there is an increase of redness of the mucous membrane, and sometimes swelling, but in most cases these are less than would be expected from the severity of the symptoms. In the nose, the turbinates become engorged and there are paroxysms of sneezing with abundant watery secretion. In the pharynx the mucous membrane becomes red, especially about the so-called follicles and the faucial pillars.

In the larynx and trachea there is a distinct reddening of the mucous membrane especially marked in the latter. The vocal cords may become involved, causing hoarseness, or they may escape entirely. There is often considerable malaise which with the local irritation, nasal obstruction and secretion, and sometimes hoarseness and cough make the patient quite uncomfortable. In uncomplicated cases the duration is seldom more than a few days, but the symptoms do not suddenly arise and as suddenly disappear, as is often the case with vasomotor rhinitis. It is rather more common in children than in adults, although persons differ much in the frequency and severity of the attacks.

The process is essentially an acute one, the period of extension seldom lasting many days and sometimes disappearing in a few hours. In typical cases there is little or no rise in temperature. At the beginning there is no formation of pus, but in the nasal and accessory cavities and the bronchi, there may be a purulent invasion following the acute stage. This second stage or secondary infection is characterized by the formation of mucopurulent secretion containing different micro-organisms, it varies much in severity and length and may result in purulent invasion of the ears, accessory sinuses or bronchi. Different epidemics of colds appear to excite different complications. One epidemic, for instance, will be accompanied by a large proportion of acute otitis media, another by bronchitis.

The susceptibility of different persons varies greatly, but there seems to be no relation between a person's susceptibility to colds in the head and his general health and strength. There appears to be sometimes a local susceptible area in the nasopharynx or elsewhere, which after treatment may disappear.

Etiology.—There is much evidence tending to show that these colds are often directly contagious. If we can prove that a definite pathological process is often due to contagion, the same process is probably always due to contagion.

Epidemics of colds are frequent. It is a matter of common observation that colds spread between children in a family or school. These cases do not begin all at once, as

would be expected if they were due to the weather, but in sequence. There is also evidence that where no chance for contagion exists this usual form of cold does not arise from exposure. Nansen mentions that on his Polar expedition no one ever had a cold. In the more recent expedition to the Antarctic under Shackleton, Dr. Marshall reports that the only suggestion of colds in the head which occurred was on opening a bundle of blankets, when symptoms of acute rhinitis appeared in the hut, but soon subsided after exercise in the open air—obviously a vasomotor and not an infectious rhinitis. It is known that on long voyages in spite of exposure, physical weakness and unhealthy surroundings, acute colds do not appear until after the vessel reaches port.

It is observed that colds have an incubation period of from two to four days, that they remain contagious for several days and that the acquired immunity is short. The disease is probably carried especially by sneezing, coughing, embracing and speaking at close range, possibly by towels and other utensils.

The criticism that the personal experience of many, and the common belief of centuries, proves that a common cold is generally the result of exposure may be answered in different ways. Within a comparatively short time the accepted etiology of several diseases has been radically changed, and generally in the direction of assigning a definite cause to a definite disease. No specific micro-organism has been found to explain the cause of this most

common form of acute cold, but this is equally true of other diseases whose nature is evidently contagious. As the community and even many of the medical profession insist on seeking some recent exposure to weather as the cause of each case as it arises, the sometimes obvious contagion is overlooked. It is a common belief that the start is given to the process by chilling of the skin, as a result of imprudence in exposure or in dress, acting in some way through changes in the body temperature or through the nervous system; or that exposure frequently gives a chance to some pathogenic organism which is waiting for the opportunity. Exposure often seems to aggravate symptoms already present, and it may start nasal symptoms of a different type. Symptoms of vasomotor or reflex origin come on at the time of exposure, and their duration is dependent upon external conditions. They do not run a definite course extending from one region of mucous membrane to another, and they seldom lead to secondary purulent complications. *It is probable that any localized inflammation which starting in one spot extends along the mucous membrane to neighboring regions, is of infectious nature.*

The above-described type of cold is by no means the only form of infectious acute rhinitis. Rhinitis may be a prominent symptom in infection by the bacillus of influenza. It accompanies measles and other constitutional diseases. Different micro-organisms may be the primary cause of a rhinitis, among them a form of staphylococcus, streptococcus,

pneumococcus, diplococcus or the micrococcus catarrhalis. Some of these organisms are found in healthy throats and consequently acute attacks caused by them would have to be explained by lowered resistance. The number of different organisms which may cause rhinitis accounts for the varying symptoms and severity of different cases. Most of them differ from the common form of cold in running a more prolonged course, in being accompanied from the start by a purulent secretion, and often a rise in temperature, and in being less contagious.

Although there is still much difference of opinion as to the rôle of these bacteria and the etiology of colds it would appear to be safe to say that certain bacteria are and others may be the cause each of its own form of rhinitis.

Treatment.—There may be said to be no limit to the various forms of treatment which have been and still are enthusiastically recommended to prevent, cut short or cure a cold. As many sensations suggest an incipient cold and as the spread of inflammation may at any time stop, a favorite remedy has a good chance of apparently proving its value. Since remote antiquity clinical experience has been cited as proof of the value of different prescriptions. One recommended in medical literature for centuries consisted of a mixture of the ashes of a swallow with honey. Pliny wrote that he found that a cold could be checked if one would kiss the nostrils of a mule. The number of our modern remedies suggests that the right one has not yet been found, or it would have driven the others from the

field. I do not wish to condemn them all, but merely to call attention to the fact that until some more positive agent has been introduced we must be prepared to see our treatment fail.

To prevent colds by increasing resistance to them, the taking of baths, especially cold baths, different forms of exercise, varieties of diet and clothing, sleeping in the open air, avoidance of excesses and a large number of excellent rules of living are often recommended. Anything which increases personal vigor is of value in the avoidance of any disease, including all acute infections. The removal of adenoids often diminishes the tendency to colds by increasing resistance locally. Less positive results are to be expected from operations on the septum.

To prevent colds by avoiding their exciting cause is a constant endeavor of a large proportion of humanity. Drafts, dampness and cold even of the most trifling degree are not infrequently avoided to an extent which might be called an obsession. The smallest details of clothing are often thought to be important. On the other hand there are many who habitually neglect these things without suffering for it. It is of course to be recommended that any form of exposure which a person has found by experience to be followed by bad results, should be avoided. But it is so frequently evident that a cold is transmitted from one person to another, that the best way to avoid the disease is to keep as far as possible from any one who has it.

A cold may be treated by general methods, by local application and by drugs. The patient's temperature is often a good guide as to whether he should be allowed to be up and about or confined to the house or bed. Bad air, overexertion, and extremes of temperature should be avoided.

Locally, nasal washes and sprays should not be used, as there is danger of infecting the ears or accessory sinuses. In the pharynx cleansing solutions may be used, or applications of nitrate of silver in two per cent. solutions. In the larynx inhalations of steam with compound tincture of benzoin are often advisable.

Internal drugs are frequently recommended. Among those often used are quinine, belladonna, bicarbonate of soda, tincture of euphrasia, and hexamethylenamine.

Within recent years vaccines have been used in the treatment and prevention of colds. Although there is much difference of opinion as to the value of these vaccines, it may be said that to be effectual the organism from which the vaccine is made must be the cause of the disturbance. The indiscriminate use of stock vaccines, especially mixed vaccines, or even autogenous vaccines made from whatever happens to be found in a culture can only be justified by good evidence of their therapeutic value which can not yet be said to have been established.

CHRONIC RHINITIS

By chronic rhinitis is understood any chronic inflammation or disturbance of secretion or sensation or patency

of the nasal cavities which can not be classified under a more definite heading. Under this definition vasomotor rhinitis and atrophic rhinitis are excluded, because they both present definite pathologic pictures.

Catarrhal rhinitis is characterized by the presence of mucopurulent secretion. In the normal state the nasal mucous membrane maintains itself nearly free from micro-organisms, and the amount of fluid secreted exactly balances that evaporated by the air. Under irritation mucus is poured out, which may become purulent and contain many bacteria. In drying, this secretion thickens and may form crusts. Secretion is either blown from the nose, or finds its way into the nasopharynx, causing the symptom which is popularly known as catarrh. In post-nasal catarrh the secretion may be formed in the post-nasal space itself, but this is rare in comparison with those cases in which it comes from the nasal cavities through the choanæ.

This form of chronic rhinitis may be the result of an acute inflammation from which the mucous membrane has not recovered. It may be due to a poor general condition or to local irritation from dust, or cold or dry air. The symptoms may recur during successive winters and disappear in summer.

The presence of mucopurulent secretion implies the presence of bacteria. These may be the primary cause of the disease or they may be secondary to some other cause. The secretion may come from the mucous membrane of the nasal passages or of the accessory sinuses or from

both. It may come from the whole surface or from some focus of disease. If the secretion is unilateral it almost invariably comes from an empyema of one of the accessory sinuses.

Treatment.—It is important to discover the cause of the secretion, and remove it if possible. The condition of the accessory sinuses must be investigated. If the secretion comes from the nasal mucous membrane, it may be cleansed by a douche or spray of a non-irritating fluid. The simplest of these is a normal salt solution, or an alkaline solution made of equal parts of salt, bicarbonate of soda and borax. Many proprietary solutions contain different aromatics. The solution is either snuffed up into the nose, or poured through into the nasopharynx, or sprayed with an atomizer. Care must always be taken that the amount of fluid is limited, and that the nose is not blown until the fluid has escaped, in order to prevent it from going into the middle ear.

In cases of persistent nasal suppuration, an autogenous vaccine is sometimes of benefit.

Intumescent, Hyperplastic and Hypertrophic Rhinitis.—These terms are used so differently by different authors, and the conditions which they represent run into each other to such an extent that I will not attempt to draw definite lines between them. The term hypertrophic rhinitis is very frequently used to describe any chronic obstruction to comfortable breathing, either recurring frequently or permanent, when that obstruction is due to an enlarge-

ment of the turbinates. If, as is generally the case, the obstruction is periodic only, or alternates from one side to the other, the trouble should be considered a functional one rather than an actual hypertrophy. This difference is sometimes expressed by the terms, intumescent and hyperplastic rhinitis. Either may be associated with the catarrhal form. On inspection the turbinates, especially the lower, are often enlarged. In judging the size of a turbinate, however, it must always be borne in mind that it is the capacity of the air-carrying channels and not the actual size of the turbinates which is important. In a large cavity the turbinates should be large and in a narrow one small. Opposite a concavity of the septum a turbinate should be larger than the corresponding one on the other side. It must also be remembered that the erectile tissue is not necessarily hypertrophied because it is engorged and a normal turbinate may be temporarily large at the time of examination. Here again the description by the patient of his local trouble may be of more importance than direct inspection. The effect of cocaine upon the erectile tissue is of service, both in aiding the inspection and in judging of the actual size of the turbinate. A hyperplastic turbinate does not shrink, but this is also sometimes true of one which is acutely inflamed. The cause of the periodic enlargement of the turbinate may not lie in the turbinate itself but the enlargement may be the result of irritation secondary to chronic infection, to disease of the accessory sinuses, or to some constitutional or nervous disturbance.

Treatment.—Cases of hypertrophic rhinitis without secretion are more often benefited by applications to or removal of part of the lower turbinate, than those cases which are combined with catarrhal rhinitis. This is because in the latter, the secretion is the probable cause of the engorgement of the turbinates, and is not relieved by the operation.

If there is dry scabbing of the vestibule and anterior part of the septum, an ointment is of benefit. The application of trichloroacetic acid or chromic acid to the lower turbinate may give relief. This should be applied carefully, all excess removed, and should never be carelessly allowed to reach the septum or nasal floor. The relief sometimes given by these superficial caustics is probably to be explained as due to local stimulation.

More active results may be attained by the use of the galvano-cautery. After cocainizing, the platinum point is sunk deep into the lower turbinate, as far back as appears necessary, the current turned on, and a deep narrow furrow made into the anterior part of the body of the turbinate by drawing the glowing point outward. The point must be quite hot and applied quickly enough not to heat neighboring parts, and the septum must be carefully avoided. The furrow should be as narrow as possible in order not to destroy more epithelium than is necessary. The ultimate result of this deep cauterization is a local contraction from cicatrization, which inhibits the erection of the turbinate. It should never be used except on the

lower turbinate, and should not be repeated often, lest the functions of the mucous membrane be destroyed.

In case the respiratory slits are so narrow, either on account of the narrowness of the nasal cavity, or the permanent hyperplasia of the lower turbinate, that normal contraction of the erectile tissue is not sufficient to give good breathing, a strip of turbinate should be removed.

Turbinotomy.—Part of the lower turbinate may be removed under either cocaine or general anesthesia. One blade of the turbinotomy shears is passed under the turbinate body, and the other above it, and an incision is made separating as much of the turbinate scroll as it is considered necessary to remove. The loop of a wire snare-ecraseur is then passed through the incision and the end of the canula carried back between the turbinate and the septum as far as the incision extends. By drawing the loop into the canula the strip of turbinate is cut through at its farther end and removed. It is necessary to insert a packing against the wound to control bleeding. This may be removed in a day or two, but as the bleeding may start again, the patient should be so situated for a few days that the packing may be replaced if necessary.

The removal of too much turbinate may result in a dry nasal cavity with a tendency to scabbing and should be carefully avoided.

In some cases an obstructing lower turbinate may be simply fractured outward and held until united in this new position, thus widening the respiratory passage.

Obstruction to breathing due to enlargement of the middle turbinate is not generally classed under the head of hypertrophic rhinitis. It may be due to bullous middle turbinate, polypoid degeneration, or other diseases of the ethmoid region. As a rule a middle turbinate chronically enlarged enough to obstruct breathing, should be removed in the manner described under the diseases of the ethmoid cells.

Hypertrophy of the Posterior End of the Lower Turbinate.—This may be an actual hypertrophy, or merely a

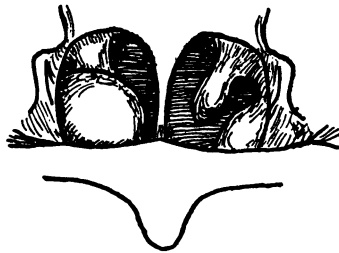


FIG. 29.—Enlargement of the posterior end of the right lower turbinate.

temporary engorgement or intumescence, the latter being the more common. The posterior end of the lower turbinate is seen in the posterior rhinoscopic mirror as a spherical body arising from the lower outer corner of the choanæ. Even under normal conditions it varies much in size and color, so that it may be mistaken for a polypus or a new growth. If it is simply an engorged posterior end of the lower turbinate it will shrink under cocaine. If there is reason to believe that from its size or its tendency to enlarge,

the patient suffers discomfort, it may be removed. This is best done by passing the wire loop of an ecraseur through the inferior meatus into the nasopharynx, bringing it from behind over the enlarged end of the turbinate and cutting this through with the wire.

Chronic Rhinitis with a Tendency to Atrophy.—Some cases of simple chronic rhinitis exhibit a tendency to atrophy of the turbinates. These may lack many of the distinguishing features of true atrophic rhinitis which term should be reserved for a special disease to be later described. These border line cases vary much in degree, and it may sometimes be impossible to be sure whether a particular case is a true atrophic rhinitis or not. The patient frequently complains of a feeling of dryness of the nasal cavities. There is a deficiency of serous secretion, the mucous membrane has a dry appearance and may be coated with occasional dry scabs or scales.

Treatment consists in a douche or spray of a cleansing solution, and occasional use of an oil nebulizer.

ATROPHIC RHINITIS

Although in certain mild cases it may be difficult to distinguish from simple chronic rhinitis, atrophic rhinitis is pathologically a definite disease. Usually in Europe and sometimes here it is called *ozena*, a name describing the foul odor of the breath in well-marked cases.

The etiology of the disease is not definitely settled. Several different possible causes have been suggested,

among them that it is caused by a distinct bacillus, that it is the ultimate result of hypertrophic or purulent rhinitis, that it follows empyema of the accessory sinuses, that it is due to faulty local development, to syphilis or to poor general conditions. Several different micro-organisms are commonly found in the nose in cases of atrophic rhinitis. Of these, one described by Abel appears to offer a good claim to be considered the cause of the disease.



FIG. 30.—Lack of nasal development in a case of atrophic rhinitis (after Zuckerkandl).

Atrophic rhinitis occurs more frequently in some countries or communities than in others. It is more common in girls than in boys and it is sometimes found in several members of the same family. It generally begins in childhood and may be fully developed at puberty. The extent of the disease varies much in different cases. Almost all cases are found in persons of the broad type of face and small

external nose. It is probable that the disease beginning in early life influences the development of the face, retarding the growth of the nose, especially of the septum and turbinates. The small size of the turbinates especially of the lower, leaves wide spaces and consequent roominess of the nasal cavities. The mucous membrane is dry and the ciliated epithelium is replaced by the squamous variety. The secretion varies in different cases; it may be mucopurulent, but in a typical case it dries and becomes adherent to the mucous membrane in the form of crusts. The crusts become foul giving a most disagreeable odor to the breath from which the name *ozena*, often used to designate the disease, is derived. The crusts may be so extensive that casts of the interior of the nasal cavities are formed. The patient's sense of smell is always dulled, and in advanced cases entirely lost, so that he does not himself perceive the disagreeable odor. Where there is a deviation of the septum, the concave side is the more subject to the drying of the secretion and the formation of crusts. Ulceration and necrosis do not occur as a result of the disease.

The changes in the mucous membrane generally extend to a greater or less degree to the accessory sinuses, the pharynx, larynx, and even trachea. The disease is essentially chronic. The symptoms vary with the climate and the patient's general condition, and the odor and crust formation may be prevented by daily cleansing. As the patient advances in life these, the two most distressing symptoms, become less troublesome, and tend

ultimately to disappear. The turbinates do not regain their proper size, nor does the sense of smell return, and there remains always a tendency to dryness and irritation of the affected mucous membrane, but the disappearance of the crusts and odor suggests a cessation of the active disease, leaving only the damage already done to the tissues. It is possible that this tendency of the disease to disappear may be due to an acquired immunity.

Treatment.—The first object is always to remove the crusts, and to prevent the drying and decomposition of the secretions. The removal of dried crusts presents little difficulty to the physician, but in some cases it is very difficult for the patient. A daily or more frequent nasal douche may be sufficient. A mild alkaline fluid should be used and the nasal cavity irrigated with a fountain syringe or soft rubber douche, care being taken that no fluid gets into the Eustachian tube. Oily sprays will sometimes help to prevent the drying of crusts. The expedient, first used many centuries ago, of packing the nares and after a short time removing the packing, will sometimes bring away the more adherent crusts. Local irritating applications, which act by exciting a liquid secretion, are sometimes used by both patient and physician, but it is doubtful if they are ever of permanent value, and they may be harmful. Among the agents which have been enthusiastically recommended within the past few years for treatment of atrophic rhinitis, may be mentioned diphtheria antitoxin, cupric electrolysis, massage of the turbinates, mucin internally and

locally, and the restoration of the body of the lower turbinates by the submucous injection of paraffin. More recently, vaccine therapy, especially with Abel's bacillus, has been used. The theory that there is ultimately a slowly acquired immunity to the disease, makes it logical to try to hasten that immunity by vaccines.

SYPHILIS OF THE NOSE

Secondary syphilis of the nose appears as an acute rhinitis, with occasional excoriation of the vestibule, and a thin nasal secretion, which may be infectious. More easily recognizable mucous patches will be found at the same time in the fauces.

The later lesions of syphilis in and about the nose may assume many forms, marked by varying degrees of infiltration and of ulceration or necrosis. The septum is especially liable to attack. A gumma may develop in any part and may involve any or all of the septal structures. The cartilage may be attacked first, in which case the septum becomes much thickened, soon breaking down in the center, forming a chronic abscess. If the disease is checked at this point the mucous membrane and bone may be saved, but there will be a saddle-back deformity of the nasal bridge. If the mucous membrane on both sides has given way, there will be a permanent perforation of the septum. The vomer is the bone most frequently affected but the perpendicular plate of the ethmoid, the superior maxilla, the palate bone, the nasal bones or the turbinates

may be attacked. The bones protecting the cranial cavity are seldom affected. The necrosis of bone may be extensive or very limited, and occurs only in a minority of cases as seen in this community probably on account of the early recognition and treatment of the disease. A loss of part of the bony septum generally results in a perforation which is often combined with the perforation of the cartilaginous portion. If the necrosis involves the hard palate a perforation between the floor of the nose and mouth is formed. If one or both nasal bones necrose there is generally also a local destruction of the skin, and sometimes a resulting perforation between the external nose and nasal cavities. If the lower turbinate is destroyed, the cavity becomes too open, and consequently dry and filled with crusts.

A milder form of late syphilis in the nose should be sought for in cases of persistent chronic nasal obstruction and secretion. The septum appears thickened, with small superficial ulcers of the mucous membrane, generally multiple. There is often but little infiltration, although considerable irritation and obstruction. It may appear in a patient who gives no history of previous disease. In many cases the evidence furnished by the patient's past history is misleading, and a better opinion may be gained by the appearance of the lesion, the Wassermann test, and the effects of iodide of potash.

The symptoms of nasal syphilis depend upon the local lesions. Infiltration causes obstruction, ulceration a purulent discharge, and necrosis a foul odor. A true ulceration

which is not acute in its course is rare in the nose from any other cause. Necrosis is even more so. This may be detected by a probe. An extensive septum perforation involving the bony structures is an indication of old syphilitic destruction.

The diagnosis is made between this condition and atrophic rhinitis by the Wassermann test, by the short history, the presence of dead bone, perforation, and active ulceration.

TUBERCULOSIS OF THE NOSE

The more malignant form of tuberculosis as distinguished from lupus is rare in the nose. Tubercular infiltration and tumors are sometimes found on the septum and on the turbinates. Tubercular ulcers are rare. Tubercular growths granular or presenting the appearance of malignant neoplasms or granulation tissue occasionally occur, forming a soft tumor which bleeds easily. This tuberculoma on the septum may by slow increase involve a large part of the septum and occlude respiration on one or both sides. Diagnosis may be made by the microscope. Such a tumor should be removed surgically by the knife or cutting forceps, including if possible all diseased tissue and as much of the septum as is involved.

LUPUS

Lupus generally occurs in the vestibule and contiguous parts of the septum, floor, and lower turbinate in connection with lupus of the face, but it may be primary. As in other

places its course is slow and not painful. It may extend outward from the vestibule, invading and ultimately destroying the skin of the tip of the nose. Within the nasal cavity it extends slowly and superficially over the mucous membrane of the anterior portion of one or both cavities, and often to the alveolar process around the upper incisor teeth.

VASOMOTOR RHINITIS—HAY FEVER

Certain persons periodically or in a particular environment suffer from paroxysms of nasal irritation, sneezing, engorgement of the turbinates and watery nasal discharge. The mucous membrane of the eyes, of the throat and of the bronchial tract may also be more or less affected. It is known that in some of these cases the paroxysms are caused by an irritating substance coming in contact with the mucous membrane, as in the typical hay fever due to the pollen of grasses or rag-weed. In other cases the exciting cause has not been found although it undoubtedly exists, as in those due to the emanations from certain animals, especially the horse. In still other cases more or less similar symptoms occur without any apparent exciting irritant to explain them. It is often asserted that these latter cases are of a different nature, but many of them have so much in common with the hay-fever group of disturbances that it may be assumed that they are due to some undiscovered irritant.

As the term hay fever applies only to those cases which are caused by pollen, some other word must be used

to include also all similar disturbances caused by other agents. Any disturbance not caused by such agents should be excluded. I have taken the term vasomotor rhinitis because it is frequently used for this purpose in this country, in spite of the fact that it is not descriptive and that it is sometimes used to include cases which do not come under this definition. Although coryza may be caused by simple nervous reflexes, I assume that the more complicated symptom-complex described by such names as Hay Fever, Rose Cold, Horse Asthma, Hyperesthetic Rhinitis, Paroxysmal Sneezing, or Vasomotor Rhinitis in most cases, at least, belongs to the group which I describe under the latter term.

Etiology.—A person has vasomotor rhinitis because of an idiosyncrasy making him intolerant to one or more substances which, although they are innocuous to others, are poisonous to him. Hay fever was for many years explained by supposing that the primary cause lies in the nervous system; that a patient suffers from hyperesthesia or increased reflexes, or other instability of function of the local nerves or of the nervous system and that the exciting substance acts mechanically upon these sensitive nerves. Other etiological factors have been suggested in deviations of the septum, intranasal contacts and uric acid in the blood. All of these theories of etiology are unsatisfactory. It is easy to accuse almost any patient of some mild form of nervousness, especially if we assume that the presence of hay fever proves a nervous disposition. But it is certain that a very large number of

truly nervous patients have not the least trace of hay fever; therefore it is not a common symptom of irritable nerves. The same is equally true in regard to malformations of the nasal cavities. But a still better argument that the condition of the nerves or the shape of the nose have little to do with causing it lies in the fact that a person susceptible to one form of hay fever may be entirely immune to another. One may be violently affected in June and perfectly well in August, whereas another may be just the reverse.

It is hard to imagine that unstable nerves or abnormal nasal cavities could make such fine distinctions between different irritating substances. It is also evident that extremely small quantities of the poisonous substance are sufficient to bring on the symptoms. All this suggests that the primary cause must be sought in what may be called a biochemical reaction. The first evidence for this theory was offered by Dunbar, who separated a proteid from the pollen of the grass family, which placed on the nasal mucous membrane of different persons acts as an irritant in all victims of the European form of hay fever irrespective of season, while all others are unaffected by it. By introducing this proteid into horses he produced an antitoxin which protects the mucous membrane from the irritant action of the grass pollen. This suggested that the cause of hay fever is a lack of immunity on the part of the patient, which immunity is possessed by normal individuals. More recently the majority of writers have explained it as an anaphylactic reaction, and this theory appears now to be

pretty well established. That patients with hay fever are constitutionally sensitized to the particular form of pollen which causes their symptoms has been recently shown by skin tests. If solutions of the various pollens are made, and one of these solutions is applied to a scratch on the skin of a patient, there will be a positive reaction if the pollen is the same as the one which causes his symptoms, and otherwise it will be negative. A similar reaction occurs with horse serum in persons who have the so-called horse asthma. If these investigations can be established it should lead not only to accurate diagnosis, but to a logical and perhaps positive method of treatment.

Vasomotor rhinitis is caused by the action of one of a group of proteids when it comes in contact with the mucous membrane of the nose or neighboring regions in a person who possesses a peculiar intolerance or is sensitized to that special proteid. There are several distinct substances each of which affects only its own particular victims. Clinically the more definitely recognized of these disturbances are the following:

The **European hay fever**, caused by a proteid contained in the pollen of the grass family and of a few other plants. This probably is the same as the form appearing in America in May and June and often called *rose cold*.

The **American autumnal catarrh**, here commonly called hay fever, caused by the pollen of rag-weed, appearing in the latter part of August and lasting through September.

The so-called **horse asthma**, apparently caused by some

emanation from different animals, especially the horse. There appears to be no doubt that persons liable to this disease are also especially liable to a disturbance of the nature of an anaphylactic shock after the injection of diphtheria antitoxin or other preparations of horse serum.

There are cases in which the paroxysms are evidently induced by other pollens, by different kinds of dust, especially the dust from the sweeping of the interior of houses, and in certain environments.

There are also cases in which the symptoms appear so frequently or so irregularly that it is impossible to trace their connection with any definite irritants. They may be so persistent that the patient may be said to have a chronic form of the disease.

It has been suggested that in certain forms of chronic infection of the nasal or accessory cavities a micro-organism may be present which produces a proteid capable of acting on the mucous membranes of the nose and bronchi in a manner similar to the proteids contained in pollen or animal emanations.

The tendency to vasomotor rhinitis occurs markedly in certain families. It may take different forms in different members of the same family, and even at different periods of the same person's life. It may start early in life or not before middle age, and it may disappear either temporarily or permanently. Its first appearance may be in full force, or it may begin mildly and slowly increase. Cases may be so mild that there is little or no real discomfort

from it, whereas in some cases it is a serious matter. Asthma may be or may become the most troublesome feature of the disturbance, or it may be altogether absent. In the more chronic cases there is often a tendency to the formation of polypi.

Diagnosis and Symptoms.—The diagnosis of vasomotor rhinitis will generally have to be made from the patient's history. During an attack the turbinates are engorged and the septum also may become temporarily thickened. This engorgement and thickening will not always yield to cocaine. The mucous membrane has a characteristic pallor, sometimes it is nearly white. This pallor distinguishes it from a simple acute rhinitis in the great majority of cases, although where the two are combined the color may be red.

The principal symptoms are those of coryza: a watery discharge from the nose, obstruction to breathing, irritation and sneezing, coming on in paroxysms. These vary much in severity and often appear and disappear suddenly. There may be irritation of the eyes and itching of the palate. If the bronchi are affected there is a feeling of oppression in the chest, fluid secretion and ultimately asthma.

During the time that a patient with vasomotor rhinitis is free from his symptoms the interior of the nose shows nothing on inspection to indicate that he is subject to the disturbance. The mucous membrane is, however, generally more or less hyperesthetic, and is sometimes so much so that simple mechanical irritation or changes in tempera-

ture or dampness induce a coryza similar to that of a paroxysm of the disease.

In passing a probe over the nasal mucous membrane of a patient with vasomotor rhinitis, it has been noticed that certain regions are very hyperesthetic, more especially the anterior upper part of the septum and the outer wall under the nasal processes. Here a light touch brings on a paroxysm of sneezing. This reflex occurs in a normal nose, but is much exaggerated as a result of the disease.

Treatment.—The most effective way to control a typical case of hay fever, as many patients have decided from experience, is to avoid the pollen. Some locality in which the patient does not suffer must be sought, if possible. If not, the vicinity of vegetation, dust, and everything which is found to bring on a paroxysm is to be avoided. The patient will often from his own experience be able to decide these details better than the physician. It is sometimes possible to mitigate the symptoms by breathing through a kind of filter, or sleeping in a room with closed windows.

It frequently happens in vasomotor rhinitis that one patient is relieved of his symptoms by some method of treatment which in other cases produces no effect. Among these methods are cauterizing with chemicals or heat, inhalations, internal drugs, and operations upon the septum or turbinates. It is possible that any intranasal stimulation may sometimes alter the conditions which produce the symptoms or diminish the sensitiveness of the mucous membrane. But even when relief is obtained by

local operation or manipulation, the results are generally transitory.

The sensitive spots on the septum may be cauterized with trichloroacetic acid or a slight application of the galvano-cautery. This should never be carried so far as seriously to injure the mucous membrane.

Resection of the septum or removal of parts of the turbinates is seldom justifiable unless it is indicated for other reasons than vasomotor symptoms. But any chronic infection in the nose or accessory sinuses should be treated, as it may be the cause of at least part of the trouble.

Sprays, douches, and inhalations seldom give enough relief to be long kept up by the patient. The effects of cocaine are very temporary and it is so dangerous that it should never be used. Adrenalin is often given as a spray and in some cases with good results, but in others it causes a rhinitis which is more uncomfortable than the original trouble.

Different internal drugs especially atropine and strychnine are often prescribed, the former to dry up the watery secretion, the latter as a nerve stimulant.

Pollantin, a preparation of Dunbar's antitoxin, made from the serum of horses immunized to the pollen of both grasses and rag-weed, is snuffed into the nose in order to neutralize the effect of these pollens. In cases of so-called horse asthma pollantin should not be given.

More recently good results have been reported from the

use of horse serum or the various pollens to which the patients react. These are sterilized, diluted and injected in quantities regulated to the tolerance of the patient, with the object of desensitizing him to his special irritant. This method of treatment is still in its experimental stage.

Treatment with bacterial vaccines both stock and auto-genous have been reported, and like all other methods of treating the disturbance, with varying results, but in our present state of knowledge should be used with caution.

NASAL ASTHMA

It has been long known that asthma in many cases is in some way connected with the nose. It is often stated that asthma may be produced by a reflex nervous impulse from an irritation within the nasal cavities, or from nasal spurs and deviations. Spurs are often to be found in cases of asthma, but it has not been shown that they are more frequently present in patients with asthma than in those who do not have any trace of it. Nasal irritation appears sometimes to excite asthmatic symptoms, but as a rule it does so exclusively in cases of vasomotor rhinitis. Nasal polypi are often associated with asthma, as they are with vasomotor rhinitis; in fact all three of these symptoms, or any two of them, so often exist together that they may be looked upon as a symptom-complex of one disease, which disease is probably due to a reaction of anaphylactic character, from one of a group of proteids. Whether the asthma is directly caused by the irritating substances reach-

ing the bronchi with the inspired air or by the systemic disturbance is not definitely known. It is possible that the reaction is of so local a character that different areas of mucous membrane may be susceptible to a varying degree which would account for those cases in which the nose alone or the bronchi alone are affected by the inhalation of pollen or other substances. The question whether in a given case of asthma the nose is involved, may be answered in the affirmative if vasomotor rhinitis or polypi are present, and probably in the negative in other cases, irrespective of deviations and spurs of the septum.

Treatment.—The nasal treatment of asthma is similar to that of vasomotor rhinitis. Operation of any kind within the nose appears to relieve some cases, but so also do operations on the appendix and other distant organs. The attempt to relieve asthma either temporarily or permanently by intranasal applications or operations, sometimes results in marked relief, sometimes in entire failure. As in treatment of hay fever, any region found especially hyperesthetic may be superficially cauterized with the galvano-cautery, or trichloracetic acid. Some authors recommend the removal of spurs or turbinotomy, especially to relieve contact between the septum and turbinate. Any intranasal operation such as resection of a deviating septum, removal of polypi or drainage of empyema of the antrum, which is indicated on its own account should be done, although its effect on the asthma may be negative. In fact the removal of polypi may temporarily increase

the asthma. Adenoids are often removed on account of asthma, but the results are generally disappointing. Cocaine should never be used by the patient for the relief of a paroxysm. Inhalations and especially the fumes of an asthma powder containing stramonium may give temporary relief.

NASAL NEUROSES

The disturbances of the nose which may properly be called neuroses should exclude vasomotor rhinitis, in which the increased reflex irritability is without much doubt secondary, and cases of pain and discomfort due to inflammation or the inhalation of irritating substances. There is considerable difference of opinion as to the frequency and the importance of reflex disturbances originating in the nose. The relation of the nose to asthma is discussed under that disease. Irritation of the mucous membrane of the nose sometimes obviously excites a reflex cough or lacrimation. Certain areas in the nose have been found to be especially sensitive, such as the anterior end of the middle and lower turbinate, the septum at the junction of the cartilage and ethmoid plate, and the external wall at the nasal process. Irritation in this region brings on different reflexes, and these points are frequently cocaineized or superficially cauterized for the relief of hay fever, asthma, and even dysmenorrhea. In all of these conditions good results have been recorded and also failure.

Nasal symptoms may be caused by a reflex originating in other parts of the body, especially the skin.

Reflex Coryza.—Nasal irritation, engorgement of the turbinates, sneezing and watery secretion are so easily and so frequently induced by exposure of the skin to cold, dampness, and currents of air that all coryza, unless it obviously comes from inhaling some irritating substance, is often looked upon as evidence of a recent exposure. The coryza which is an early symptom of infectious rhinitis is most frequently mistaken for a reflex coryza and the whole process unjustly credited to the patient's latest imprudence. Reflex coryza comes on at the time of exposure, and if the mucous membrane is normal, it seldom lasts long after the cause is removed. If, however, the mucous membrane is pathological, the symptoms may be increased and prolonged. It is characteristic of infectious rhinitis that the inflammation slowly spreads from one area of mucous membrane to another.

Neuroses from Contacts.—The septum and the turbinates should normally be separated from each other by a distance allowing the erectile tissue of the turbinates room for engorgement. As a rule deviations and spurs of the septum are compensated for by corresponding changes in the contour of the turbinates, but this adjustment may not be sufficient to avoid points of contact. This occurs especially between parts of the middle turbinate and the septum, and at points where a sharp spur digs into the turbinate opposite to it. These contacts may exist without producing any symptoms. In other cases reflex disturbances, pain and headache are attributed to them.

It is often impossible to judge whether the patient's symptoms are or are not connected with an intranasal contact, or are due to some other cause. It is doubtful if asthma ever arises in this way. Nasal irritability and dysmenorrhea have been traced to this source, but are more likely to come from something else. Disturbances in the eye, neuralgic pain radiating from the nose and headache are more frequent symptoms especially if they are on the same side as the contact, if temporary relief is obtained from cocaine, if no other cause can be found for the symptoms and if they are chronic or periodic. When there is reason for believing that a contact is causing trouble, it should be removed. A spur of the septum should be resected. If the middle turbinate is pressing on the septum, the septum if deviated should be resected, otherwise a portion of the turbinate should be removed.

Sphenopalatine Neuralgia.—The sphenopalatine ganglion lies in close relation to the posterior outer wall of the nasal cavity, in the pterygopalatine fossa. It may therefore become affected by direct extension of inflammation from the nasal cavities. Sluder describes the resulting neuralgic pain as beginning at the root of the nose, extending downward over the maxilla and backward to the mastoid, thence to the occiput and downward into the neck and shoulder. He cocaineizes the region in the nose overlying the ganglion for the relief of the pain, and for more permanent results injects alcohol directly into the ganglion by passing the needle upward and

outward under the posterior portion of the middle turbinate.

Anosmia.—The nerves of smell descend from the olfactory bulbs through the cribriform plate and are distributed over the septum and external nasal walls of the superior meatus. They not only perceive odors entering with the inspired air but also flavors and aromas which reach them from the mouth through the pharynx and choanæ, and which are often attributed to the sense of taste. Consequently if the sense of smell is lost, the sense of taste is much impaired. Anosmia may be partial or complete, temporary or permanent. It may be caused by inflammation of the mucous membrane, or by obstruction into the olfactory nervous system. It is sometimes congenital.

It may be present for a few days in acute rhinitis.

It may be due to extensive nasal polypi, in which case it disappears after the obstruction has been removed.

It is common and permanent in cases of extensive atrophic rhinitis.

Influenza may be followed by temporary and sometimes permanent anosmia.

It may be caused by tobacco, lead or other local or systemic poisons.

It may be a symptom of tabes or other disease of the nervous system.

Anosmia not very infrequently appears temporarily, and sometimes permanently, without any obvious reason. Or

it may be a symptom of some constitutional weakness or nervous instability.

The prognosis for the return of the sense of smell is uncertain, except when the cause is a temporary one.

Treatment.—When the anosmia is due to mechanical obstruction to the entrance of air into the upper part of the nose, this should be corrected. When the olfactory organ itself is defective, there is no effective treatment.

NASAL HYDRORRHEA

Nasal hydrorrhea or rhinorrhea is the discharge of a watery fluid from the nose. It is usually unilateral. There are two distinct forms. In the first the secretion arises from the mucous membrane, and is due to a local disturbance of the secretory apparatus, without other symptoms of vasomotor rhinitis. Cases have been reported under the title of hydrops of the antrum in which the source of the fluid has been the antral cavity.

In the second form the secretion is cerebrospinal fluid which escapes from the cranial cavity through a defect, probably in the cribriform plate. In some cases the fluid escapes only when the head is held forward. It is sometimes possible to collect several drams in the course of an hour, although this is liable to produce a headache. Except for this the patient may not suffer from the defect.

The differential diagnosis between these two forms of rhinorrhea by chemical analysis of the fluid is possible, but

sometimes uncertain, on account of the similarity of the fluids.

The prognosis for both forms is indeterminate. In some reported cases the flow has stopped spontaneously, in others it has been persistent. Except in cases where the flow was from the antrum no method of treatment has been effective.

NASAL MUCOUS POLYPUS

A nasal polypus is not, strictly speaking, a new growth, but an edematous hypertrophy of mucous membrane due to some local inflammatory process. Polypi are formed only in the ethmoid region including the middle and superior turbinates and in the interior of the accessory sinuses. They do not arise from the septum and inferior turbinate. A polypus consists of loose connective tissue, poor in blood vessels and covered with an epithelium, which is at first similar to that of the rest of the nasal cavity, but becomes changed from the ciliated to the pavement form. Preceding the formation of polypi the mucous membrane becomes swollen, pale and edematous. This may be limited to small areas or it may spread to all of the regions mentioned, though less common in the posterior than the anterior part of the nasal cavities. When limited in area it is more often seen on the anterior end of the middle turbinate and about the hiatus semilunaris. As the swelling and edema increase, the dependent portions not restricted by adjacent bone become pendulous and later

pedunculated, forming one or more polypi which may fill all of the available space in the nasal cavity or accessory sinuses, but do not after the manner of new growths push aside or destroy neighboring structures.

The etiology of polypi has long been discussed and no theory has as yet been commonly accepted. They were at first looked upon as a form of tumor; later, disease of the underlying bone was thought to be the primary cause, but now they are generally ascribed to some form of chronic inflammation or irritation of the mucous membrane itself. Consequently, where the cause is unilateral, polypi will be found in one nasal cavity only. The most usual cause of unilateral polypi is an empyema of an accessory sinus, in which case the sinus may also contain polypi, one or more of which may protrude through the ostium into the nasal cavity. Polypi may also form in the neighborhood of a malignant or benign neoplasm.

If the exciting irritation is bilateral, polypi will be found in both nasal cavities. Although bilateral polypi may be due to bilateral sinusitis or other local cause, the most common cause of polypus formation or polypoid degeneration is some form of vasomotor rhinitis. In these cases there is generally a history of nasal irritability, sometimes a typical hay fever and frequently asthma. If vasomotor rhinitis be assumed to be caused by lack of immunity or anaphylaxis, the asthma is probably due to the same process and the polypi are secondary to the local irritation. The exciting irritant is not necessarily an

external one, it may sometimes be the product of a chronic infection.

Polypoid degeneration of the mucous membrane generally begins about the anterior end of, and under, the middle turbinate. In extensive cases it may involve the whole middle turbinate and the interior of all the accessory sinuses. If the primary cause of the growth of polypi is a localized suppuration, pus will be found in the nose. In

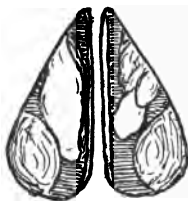


FIG. 31.—Diagram showing a polypus growing from the middle turbinate on the patient's right, and small polypi in the left middle meatus.

vasomotor cases the secretion is mostly mucus, and varies at different times, being easily increased by acute rhinitis or other nasal irritation. If the secretion is mechanically blocked it becomes mucopurulent. The sense of smell is weakened and sometimes absent, but this is in most cases due to mechanical obstruction and returns when the obstruction is removed.

Bilateral polypoid degeneration varies much in extent in different cases. It occasionally, but rarely, occurs in children, but if it does, and is extensive, it may affect the development of the face, broadening the base of the nose and separating the orbits. It commonly begins in young

adult life. The tendency to polypus formation may subside or disappear, especially when the process has been slight and under proper treatment.

The diagnosis of a polypus is made by its white and glistening appearance and by its mobility. The tendency

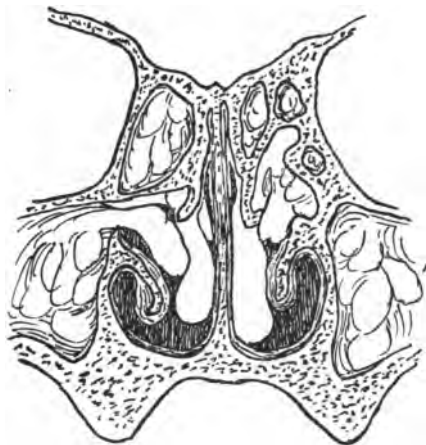


FIG. 32.—Diagram of a cross section through the nasal cavities showing polypoid degeneration of the mucous membrane of the region of the middle turbinates.

to polypoid degeneration is recognized by the irregular edematous appearance of the ethmoid region and the presence of small polypi.

A single polyp is sometimes found filling a large part of the post-nasal space, and even reaching as far as the uvula, its attachment being a long, thin pedicle coming through one choana and originating somewhere in the nasal region, perhaps coming through the ostium of the antrum. It is distinguished from other tumors of the posterior nares by

its long, slender pedicle. Polypi of this variety frequently contain cysts.

Treatment.—As far as the polypus itself is concerned, treatment consists in removing it. This is best done with a cold wire snare threaded with No. 5 piano wire. The nasal chamber, unless it is so obstructed that no air will go through, is cocainized by spraying into it a one per cent. solution which the patient, by forcing air in and out alternately, brings in contact with the whole mucous membrane; or the mucous membrane may be wiped with cotton containing a ten per cent. solution of cocaine. The wire loop is made large enough to surround the polypus and is passed flat along the septum until the canula has almost reached the growth. The lower portion of the wire is then turned under the polypus and the loop carried upward as far as it will go in the direction of the middle turbinate. By drawing the wire into the canula the polypus is cut through near its attachment. There is but little bleeding, and the pain is slight from the growth itself, although the contact of the instruments with other intranasal structures may be painful. All growths that can be engaged in the loop of the snare should be removed. The principal sources of difficulty in removing polypi are deviations and spurs of the septum. In the narrow side it is necessary to work slowly and carefully, to avoid injuring the septum.

A large polypus attached by a long slender pedicle to some point within the nasal cavity or antrum will sometimes be found hanging down into the nasopharynx. As it is diffi-

cult and painful to get the loop around this, the pedicle may be caught through the nares with a blunt hook and cut through with a bistoury. Before dividing the pedicle care must be taken to prevent the tumor from being inhaled or swallowed. The patient must be warned to prepare for it by holding his breath and throwing his head forward.

The polypi of the nasal cavity having been removed, the underlying cause should be sought. If the polypi arise from a limited area, as about the hiatus semilunaris of one side, the condition of the neighboring sinuses should be ascertained. If one or more of the sinuses contain pus, the empyema should be treated as the primary disease. In the more diffuse or what might be called the vasomotor, or idiopathic form of polypoid degeneration, the amount of treatment advisable after all possible polypi have been removed, must depend upon the extent of the trouble and the discomfort of the patient. A mild case may require nothing more than the removal of the polypi, possibly repeated after a few months or years. If this is not sufficient to make the patient comfortable, further intranasal operating must be considered. Often the discomfort of the patient arises more from the nasal irritation than from the polypi. The polypi themselves obstruct the nose, and their removal will open it, but it will not necessarily help the vasomotor symptoms or asthma.

If the patient's breathing is still obstructed after all polypi have been removed, the whole or part of the middle turbinate should be cut away or the ethmoid labyrinth

exenterated, or in extreme cases all sinuses containing polypi opened and cleaned out.

To what extent it is justifiable to carry operations in order to reach all regions showing polypoid degeneration, must depend upon the individual case. Good nasal breathing should always be established, after which the patient may suffer but little inconvenience and the disease may of itself improve. The accompanying asthma and nasal irritability may continue after the nose has been thoroughly cleared. Nasal polypi are prone to return if the underlying disease continues. They often do so very slowly and if the cause is removed disappear entirely.

It will readily be understood that the old custom of attempting to cauterize the base of the polypus after its removal is irrational and may even become dangerous by setting up a septic inflammation.

FOREIGN BODIES IN THE NOSE

Foreign bodies of different kinds may find their way into the nasal cavities. This happens most commonly in children who sometimes put a boot button or bean or similar object into the nostril and can not get it out again. As they do not always confess what they have done, it may remain for a long time unsuspected. The symptoms are obstruction, and purulent discharge, sometimes with blood, in most cases unilateral. *It is well to bear constantly in mind that a unilateral, purulent discharge in children often means a foreign body; in adults an empyema of an accessory*

sinus. The discharge may have an offensive odor, and may keep up an excoriation in the neighborhood of the nostril.

A hard substance is easily detected with a probe. A careful search with a good light, sponging away the secretion, will seldom fail to disclose the object even if it is soft and friable. A hard substance may be removed by passing a loop of fine piano wire along the septum until it has got beyond the foreign body, which is then drawn out in front of the loop. Soft substances may be removed with forceps or by a cotton-stick. If a child is unruly it is well to give it a small amount of ether.

In adults the more common foreign bodies unsuspected by the patient are pieces of cotton forgotten by a physician. In the tropics the bodies of insects are sometimes found.

Rhinoliths.—Concretions of lime salts sometimes form in a nasal chamber around some nucleus. These may become large, sending out prolongations into the meati, so that they can not be removed without first breaking them. The symptoms and treatment are the same as for foreign bodies.

NARROW NASAL CAVITIES

The width of the nasal cavities, or the distance between the septum and the nasoastral walls may be so abnormally narrow, that there is not room for the normal functions of the turbinates, and periodic nasal obstruction results. The nasal cavities are separated from the cavity of the mouth by the hard palate, which forms the floor of the

former and the roof of the latter. Consequently a narrow nasal cavity is often associated with a high and narrow dental arch. The dentist is sometimes able to broaden this arch with a corresponding broadening of the nasal cavities above. It is well, therefore, before sacrificing part of the lower turbinates, to consult with a dentist. If the condition of the alveolar process and teeth warrant an attempt to widen the hard palate, this may be all that is necessary to restore normal nasal breathing. If not, a part of the lower turbinate on each side should be removed.

CHAPTER VII

DISEASES OF THE ACCESSORY SINUSES

DISEASES of the accessory sinuses may be either acute or chronic. One cavity alone may be involved or any number may be affected. Often the process is an extension of inflammation from the nasal cavities, generally an infection.

Acute sinusitis is almost invariably preceded by an acute rhinitis. In some epidemics of rhinitis the sinuses are more frequently involved than in others. A latent chronic sinusitis will often become acutely inflamed during a cold in the head. The common symptoms of acute sinusitis are unilateral discharge and pain about the face. There may be more or less rise in temperature. The pain is generally caused by swelling of the mucous membrane and perhaps local neuritis, but if the opening of a sinus becomes occluded, there may be tension from retained secretion. Fortunately this does not often occur. When it does, the pain is increased and there may be danger of perforation of the sinus wall.

On inspection, localized inflammation and often mucopurulent secretion can be seen about the ostium of the sinus in the nose. The symptoms of acute sinusitis of the different sinuses will be described later.

Chronic Sinusitis.—The sinuses may all be involved in a disease in common with the nasal cavities, as in atrophic rhinitis, polypoid degeneration, or catarrhal rhinitis. One or more of them may be chronically inflamed and contain pus. The cause of the empyema may be evident or discoverable, as in cases of foreign body, trauma, syphilis, or a suppurating tooth root. But unfortunately in many cases the cause can not be found. If it could be, it would make our methods of treatment more rational and certain, and would probably decrease the necessity for extensive operating, by leading the surgeon at once to the focus of trouble. As a rule the empyema will last as long as the cause remains, and will get well when the cause is removed.

In the great majority of cases, where there is pus or any secretion in a sinus, it escapes without difficulty through the natural opening although, especially in the antrum, it may leave a residue which becomes foul. The mucous membrane becomes more or less thickened, sometimes edematous or polypoid. Pain is generally absent, although it may be a prominent symptom. Total occlusion of the outlet for secretion, which is fortunately rare, may be followed by perforation through the sinus wall. In addition to secretion and local pain, disease of a sinus may be the cause of neuralgia, headache, and disturbance in the eye.

A unilateral, purulent, nasal discharge always suggests empyema of an accessory sinus. The differential diagnosis between diseases of the different sinuses is aided by trans-

illumination and the x-ray. The symptoms and treatment are taken up under separate heads.

THE MAXILLARY ANTRUM

Acute Maxillary Sinusitis.—It happens not infrequently that an acute inflammation of the antrum follows an acute rhinitis. Unless attention is called to it by the presence of pain, the fact that one or both antra are involved is often not suspected. The secretion may be at first serous, later mucopurulent. In rare instances the maxillary ostium may become occluded and the secretion be confined in the antrum under pressure, but with few exceptions, the ostium allows the secretion to escape readily into the nasal cavity.

Symptoms.—Pain if present is generally neuralgic in character, it is infraorbital, and not infrequently referred to the alveolar process or the teeth. If the ostium is occluded the pain is much increased. But localized pain, tenderness, and swelling are more often caused by inflammation of a tooth socket or the nasal vestibule. There is generally unilateral nasal secretion from the affected antrum, as a rule mucopurulent and not foul. In specially severe forms of acute infection, the secretion may be fluid pus, sometimes foul, the pain and tenderness especially marked. These latter cases show a rise in temperature; in the milder cases there is little or none. Transillumination, if the sinusitis is unilateral, shows obstruction to light on the affected side.

Treatment.—Treatment is in most cases unnecessary. The symptoms subside in a few days and no time is saved by local treatment. Nasal douches and sprays are to be condemned; they are very seldom needed to clear the nasal cavities, and they may carry infection into other sinuses. In cases of virulent infection, as shown by pain and temperature or in case of obstruction to the ostium with bulging of the nasoantral wall, a sufficiently large hole should be made in the inferior meatus to insure drainage, and the antrum washed out.

Chronic Empyema of the Antrum.—This may be caused by infection from the nose, by abscess or caries of a tooth socket where communication with the antral cavity has been established, by a foreign body, by disease of the antral wall or by pus finding its way into the antrum from the ethmoid or frontal sinus. The pus is often foul and may be perceived by the patient to be so.

Diagnosis.—There is discharge of pus from the nose on the affected side which may be seen to come from the ostium, a shadow in the x-ray plate and darkness on transillumination. The diagnosis may be made certain by washing pus from the cavity.

It must always be remembered that pus in the antrum may have originated in some other sinus, or it may be only a part of a general sinusitis.

The presence of pus having been established, it is important to discover its cause. The condition of the teeth, especially the molars, must be investigated. This is some-

times aided by the x-ray. Any carious roots should be removed and at the same time it may be possible to enter the cavity through the socket of one of them. This establishes an opening through which the antrum can be washed out. If the teeth are sound and the antrum alone is involved, we assume that there is in the cavity some local cause for the suppuration. This may be a foreign body, some suppurating focus, possibly connected with the teeth, discharging into it, or a diseased condition of the antral wall.

Treatment.—Whatever the cause of the empyema, it is well to wash out accumulations of pus periodically, until further treatment makes it unnecessary. By this washing a foreign body may be removed, or a diseased wall may recover if due to the presence of foul secretion.

Washing the Antrum.—The ostium maxillare is normally a difficult or impossible passage to find with a probe. In chronic disease of the sinus, and in cases of polypoid degeneration, the ostium can be found in a large proportion of cases. This may be accounted for either by supposing that an empyema or the polypi enlarge the opening, or that an abnormally large opening permits infection to reach an antrum which would otherwise have remained sterile.

An antrum may be washed out either for diagnosis or for treatment. If the ostium is readily found, a hollow probe, bent for half an inch from its end to nearly a right angle, is passed through it, and a stream of sterile salt solution injected with a syringe or irrigator. Care should be taken

that space is left for a return current, or the tension in the antrum may become painful.

If the ostium is not readily found, a prolonged search is more uncomfortable for the patient than the making of a counter opening in the inferior meatus. To do this, ten or twenty per cent. cocaine with one-fifth part adrenalin is rubbed with a cotton applicator under the anterior end of the lower turbinate. A hollow trocar or trocar and canula, bent to the proper angle, is passed under the lower turbinate to a point about an inch from the introitus, and as high as possible above the nasal floor. Here the antral wall is thin, and the trocar is readily thrust through it. If the trocar and canula are separate, the former is withdrawn, and a syringe small enough to be easily controlled with the hand is attached to the canula. A stream of sterile salt solution is then injected into the antrum. If the ostium is sufficiently large, the antral contents are washed through it, and with the head held well forward flow out through the nostril into a basin. The size of the ostium is readily determined by the rapidity with which the solution can be injected without causing painful tension in the cheek. If the ostium is small or obstructed, the fluid flows out very slowly, sometimes only drop by drop, and forcing the fluid becomes painful to the patient. If the antrum is full of polypi the quantity of secretion washed from it will necessarily be small. If the cavity is empty the fluid will not return until it has reached the level of the ostium, and it will be clean. As previously described, a

small trocar can be used for diagnosis. If, however, an opening for periodical washing is made, it should be made large enough to remain open for a reasonable time, and to be easily found by the hollow probe. This can be done by using a large trocar, and enlarging the opening with bone forceps. The solutions used should be bland and un-irritating, such as normal salt or boric acid solution. Strong antiseptic solutions generally do more harm by irritation than good by destroying bacteria. Washing can sometimes be made more effective by injecting the solution with a certain amount of force. The cavity often has pockets and partial septa which a gentle stream of water does not reach, and if there is any foreign body loose in the sinus, it is much more likely to be expelled by forcible washing. The pressure should begin gradually and never go to the point of being painful to the patient. The amount of pressure that can be applied will depend upon the size of the outlet; if this is obstructed, a comparatively small amount of pressure of the syringe will make a tension in the cavity which will be intolerable.

The antrum may be washed through the socket of a missing molar tooth, by boring upward with a burr drill attached to a dental motor. The advantage of this opening is that the patient himself can easily pass a canula into the cavity and wash it out. It is, however, never advisable to sacrifice a tooth in order to reach the antrum through the alveolar process.

Operation through the Nose.—When it is evident that the

empyema continues in spite of the washing, more radical measures must be taken. To establish free drainage of the antrum the wall between it and the nose may be partly removed by intranasal operation. Different operations and instruments have been devised for this purpose. A small hole through this wall will close; to insure permanency, it is necessary to make a large one. The inferior turbinate is attached across the middle of the nasoantral wall. This may be left in place, and the inferior meatus alone connected with the antral cavity by removing the partition of bone with bone-cutting forceps. As much nasal mucous membrane as possible should be saved, to cover the denuded surface.

To make a larger opening the anterior third of the inferior turbinate may first be removed with turbinotomy scissors or bone forceps, or it may be detached along its anterior half and temporarily pushed up while the hole is made in the nasoantral partition. These operations may be done with cocaine, although with many patients a general anesthetic is necessary.

Operation through the Canine Fossa.—A more radical operation for reaching the antrum is through the canine fossa. A general anesthetic is necessary. The operation may be done in the sitting, semi-recumbent, or dorsal position.

The upper lip is retracted, and a long incision made through the mucous membrane just above the alveolar process, the incision is carried down through the periosteum,

and the bone of the canine fossa laid bare. A perforation is made into the antrum, a director put in, to show the size and shape of the cavity, and the thin bone of the canine fossa removed with a bone cutter. The interior of the antrum can then be explored and all polypi removed, either under direct sight or with the aid of a small reflecting mirror. Search should be made for any caries or fistula in the neighborhood of the tooth roots. If a foreign body is found and removed and the mucous membrane is intact, a piece of gauze may be put in the wound for a day or two, and the wound then allowed to heal. In most cases, however, it is advisable to remove a part of the wall between the antrum and the nasal cavity, in order to create a wide and permanent communication between them (*the Caldwell-Luc operation*). Part of the lower turbinate is generally removed during the operation.

After the operation the antrum may be packed with gauze, but except to control bleeding this is not necessary. If there is no packing, the opening through the mouth falls together and heals quickly, while any necessary irrigation can be done through the nose. If packing remains in the antrum, it should be removed as soon as it can be dispensed with.

THE FRONTAL SINUS

Acute Frontal Sinusitis.—An acute frontal sinusitis may follow an acute rhinitis by extension of the infection. It is usually unilateral and apt to be recurrent; some persons suffer from it whenever they have a cold. In a typical case

the pain is characteristic. It begins in the morning, not long after waking, becomes worse, occasionally very intense, toward the middle of the day, and disappears at some hour in the afternoon, to return again the next morning. It is frontal and unilateral, except that it may spread to other parts of the head. There is almost invariably marked tenderness to pressure over the inner canthus. Occasionally, though luckily rarely, the secretion can not escape from the cavity, in which case the pain is intense and is not influenced by the time of day. In these cases there is danger of perforation of the orbital wall.

Diagnosis.—In cases of actual frontal sinusitis the characteristic pain and tenderness described above make the diagnosis probable. There is generally unilateral nasal discharge, often pus to be seen about the infundibulum, sometimes localized redness and edema about the anterior end of the middle turbinate. Transillumination and x-ray may show a relative shadow upon the affected side.

Treatment.—It is generally better not to probe the frontal duct, as the resulting irritation increases the swelling and obstruction of the outlet of the cavity. An application of cocaine and adrenalin may free the outlet, but should be used sparingly to avoid danger of reaction. If the middle turbinate is seriously blocking the outlet of the frontal duct the anterior end should be removed, by the method described under the ethmoid cells. Cold externally and aspirin or phenacetin internally may give relief. The inflammation lasts from a few days to two weeks. In rare cases when

the frontal duct has become occluded and pus under pressure is retained in the frontal sinus, it may become advisable to clear the nasofrontal duct by opening up the anterior ethmoid cells through the nose, or even to open the sinus externally.

Empyema of the Frontal Sinus.—Empyema of the frontal sinus is usually unilateral, and often accompanied by disease of the anterior ethmoid cells. The cause of the empyema generally remains undiscovered, even after a radical operation for its relief. In some cases it follows a blow on the orbital ridge, suggesting a fracture and necrosis of a piece of bone. It is conceivable that a foreign body may enter the sinus and, failing to get out, keep up a chronic irritation. In general polypoid degeneration of the ethmoid the frontals may become involved, in that case often bilaterally.

Diagnosis.—In empyema of the frontal sinus pus can generally be seen under the middle turbinate. As the opening is at the bottom of the sinus the discharge does not accumulate and come away in large quantities at a time as in the case of the antrum, and it does not often become foul. There may be a small discharge from a frontal sinus continuing for many years and giving the patient but little discomfort.

Pain varies greatly in different cases. There may be none. There is often more or less frontal pain or neuralgia over the eye coming on periodically. Occasionally the pain and discomfort is great, and urgently demands relief.

The x-ray plate furnishes valuable corroborative testimony in disease of the frontal sinuses. The two lateral plates show the height and depth of the cavities. With this knowledge the frontal plate indicates the presence of pus or disease on one side by lack of definite outline in the affected sinus as compared with the other. A diseased sinus loses its distinctness in the plate. The knowledge of the size of the two sinuses derived from the plates makes transillumination available in those cases in which the sinuses are large enough and go high enough upon the forehead to transmit light from the orbital roof.

A normal frontal sinus can seldom be reached by a probe through the nasofrontal duct, but in cases of chronic supuration and polypoid degeneration it is often easy to pass a probe and to wash out the cavity.

Treatment.—If the frontal sinus can be easily reached through the nasofrontal duct, it may be periodically irrigated, but this seldom leads to a cure. In order to remove diseased mucous membrane from the cavity, and to establish good drainage, it is necessary to open it either intranasally or externally. To reach the sinus through the nose the frontoethmoidal cells are opened and bony partitions, including the anterior end of the middle turbinate, removed with a curette and bone-cutting forceps. This should lead to the floor of the frontal sinus and to the ostium, which is then enlarged by removing as much of the floor as possible. This region is in close relation with the cerebral cavity and operation is, therefore, justifiable only

when done with an accurate knowledge of the anatomy and the possible anatomical anomalies, under the guidance of an x-ray plate showing the size and shape of the cavities.

When an intranasal operation is insufficient or contraindicated by the anatomical dangers, and the severity of the symptoms demand it, the sinus must be opened externally.

Killian's operation, or some modification of it, is the one generally adopted. In this operation the cavity is thoroughly exposed, the drainage into the nose is made as complete as possible, the ethmoid cells, which are generally also involved, are directly reached, and the resulting disfigurement is ingeniously prevented.

Before operating, the size and position of the sinus should be found by x-ray. This will prevent the danger of coming down upon the dura mater instead of the mucous membrane of the sinus, and will call attention to partitions and prolongations of the cavity. It will also show the depth of the relations between the floor of the sinus and the nasal cavity.

An incision is made through the middle of the eyebrow for its whole length, and continued in a curve downward along the root and side of the nose to a point a little below the base of the nasal bone. This incision goes through the skin only. An incision is then made to the bone a little above and parallel to the supraorbital margin, and the periosteum above this incision is elevated and retracted.

The sinus is then opened with a chisel and the anterior wall, as far down as the incision through the periosteum, cut away, any partitions broken down, and polypi and diseased mucous membrane removed.

A second incision through the periosteum to the bone is made a quarter of an inch internal to the supraorbital notch, and extending inward on the orbital margin until it intersects the nasal portion of the skin incision, which it follows to its lower end.

The periosteum between the two incisions is left in place, but from the lower incision over the nasal process of the superior maxillary bone, inward into the orbit, it is elevated and retracted, the orbit in the meantime being protected. Upon reaching the lachrymal sac, this is lifted from its groove, care being taken not to injure it. The bone is then laid bare toward, but not to, the supra-orbital notch and pulley of the superior oblique. The nasal cavity is then entered by trephine, chisel and bone cutter, starting at the upper part of the nasal process of the maxilla near its junction with the frontal and nasal bones and including a small portion of the two latter. The removal of this bony area gives free access to the floor of the sinus and the nasal cavity. This makes a space in which to remove the remaining sinus floor, part of the lachrymal bone, as many of the ethmoid cells as is found necessary, and even to open the sphenoidal sinus if it is diseased. In doing this resection, the limitations must be kept in mind: the lower part of the lachrymal groove

below, the anterior ethmoidal vessels behind, and the trochlear attachment and supraorbital notch above.

A supraorbital bridge of bone, covered with periosteum, is left between the opening directly into the sinus above and that into the ethmoid region below. This bridge is essential to prevent disfigurement.

After the above resection has been completed there is a large opening from the frontal sinus into the nose, with the supraorbital bridge in front. After removing as much of the ethmoid cells and intranasal structures as is advisable, the nasal cavity is packed for two days and the wound through the skin brought together and sutured, except when it is considered safer to keep it open temporarily.

DISEASES OF THE ETHMOID CELLS

Compared with the other accessory sinuses, the ethmoid cells are individually smaller, multiple and more intimately connected with the nasal cavities. They are divided into an anterior and a posterior group; the former drain under and the latter above the middle turbinate. The anterior cells are often involved in diseases of the frontal sinus and antrum, and the posterior cells in disease of the sphenoidal sinus.

An acute rhinitis not infrequently extends to the ethmoid cells, causing discomfort and secretion in the upper part of the nasal chambers.

One or more of the ethmoid cells may be primarily dis-

eased, or they may be involved secondarily to empyema of another sinus. In polypoid degeneration, the interior of the cells, especially of the anterior group, often contain polypi.

Diagnosis.—The region of the anterior ethmoid cells can be seen under the middle turbinate by anterior rhinoscopy. The region of the posterior cells is best seen by looking above the middle turbinate in the rhinoscopic mirror. In acute ethmoiditis, the mucous membrane is reddened and swollen, and there may be serous or mucopurulent secretion. If the condition is unilateral the contrast between the affected side and the normal one is marked. In chronic empyema of one or more ethmoid cells, pus will be seen about the ostia of the diseased cells. On the x-ray plate there will be a shadow between the orbit and the septum on the affected side.

In polypoid degeneration, the anterior end of the middle turbinate and the neighborhood of the bulla appear pale and edematous, and polypi are seen arising from this region. When the posterior cells are affected, the diagnosis is more easily made by the posterior-rhinoscopic mirror, in which the posterior end of the middle turbinate and the region above it will be seen to be edematous.

Treatment.—Acute ethmoiditis generally requires no local treatment. The secretion remains fluid and can be blown from the nose as soon as it escapes into the free nasal cavity. Operative measures are not called for, except that a very severe case might be benefited by

removing the anterior end of the middle turbinate to improve drainage. This is often of use in chronic cases, but acute cases generally get well readily without assistance.

Both in chronic empyema and in polypoid degeneration, good drainage of the affected area is desirable. The anterior end of the middle turbinate may be removed if the trouble is in the anterior cells, or the whole turbinate if in the posterior cells. The affected cells may be broken into with a curette, Hajeck's hook, or punch forceps, or the whole ethmoidal labyrinth exenterated.

Removal of the Middle Turbinate.—To remove the anterior end of the middle turbinate, a perpendicular cut is made with the punch forceps at a point a third to a half the length of the bone from the anterior end. This allows the wire loop of a snare to surround a large portion of the anterior end of the turbinate. With the end of the loop in the cut, and the canula kept as high as possible at the anterior attachment of the bone, the wire is drawn into the canula. It is well to use a snare which can be converted into an ecraseur by a screw attachment in the handle. If necessary, the operation may be continued with punch forceps. This exposes the hiatus semilunaris, the bulla, and the region in which the anterior sinuses open into the nasal cavity.

To remove the whole middle turbinate an angular or a stirrup-shaped knife is passed around the posterior end of the bone and drawn forward, removing it in one piece.

Operations to Open the Ethmoid Labyrinth.—It is always important in surgical treatment of the ethmoid not to do anything blindly. No force at all should ever be exerted in an upward direction, and great care taken in going backward. The region of the cribriform plate must be avoided.

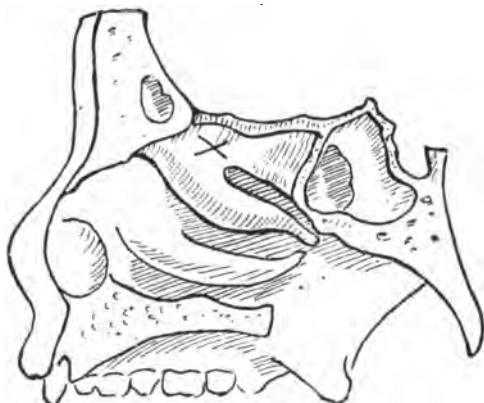


FIG. 33.—Traced from Mosher's diagram to show the point at which he carries his curette into the ethmoidal labyrinth, X.

The cells may be opened with a curette, and partitions removed with cutting forceps which do not tear.

After operating, it is sometimes necessary to pack the ethmoid region to stop bleeding, but as a rule safety lies in good drainage, and packing should not be used longer than is necessary.

In Ballenger's operation a large part of the ethmoid labyrinth with the middle turbinate is removed in one piece by a special draw knife.

In Mosher's operation the anterior cells behind the nasal process are directly broken into with a curette. The rest of the ethmoidal labyrinth is then opened by following the attachment of the middle turbinate backward, after which the middle turbinate is removed with the cell walls.

DISEASES OF THE SPHENOIDAL SINUS

Acute Sphenoidal Sinusitis.—This may appear secondarily to a common cold or other acute infection of the nose or nasopharynx. It is generally unilateral and begins some days after the primary rhinitis. The symptoms are pain referred to the region of the orbit, sometimes with discomfort or weakness in the eye itself. The pain is not diurnal as is often the case with acute inflammation of the frontal sinus. The patient is generally aware of a post-nasal secretion into the pharynx. On inspection with the rhinoscopic mirror the mucous membrane in the sphenoidal region is seen to be reddened, swollen, and may be covered with mucopurulent secretion showing a marked contrast to the same region on the normal side.

Save in very exceptional cases no surgical treatment should be attempted. If it is suspected that the ostium is blocked and that there is pus under pressure in the sinus, threatening meningitis by extension through the roof of the sinus, an opening would have to be made through the nose. The pain may be relieved by aspirin, phenacetin, or morphine, or locally by cocainizing the ostium.

Chronic Empyema.—Chronic empyema of the sphenoidal

sinus may occur in connection with empyema of the other sinuses, or occasionally alone. Pain may be entirely absent, or it may be periodic and neuralgic in character, referred to the orbit or other parts of the face. As the sinus is separated from the cerebral cavity by a thin plate of bone only, there is sometimes a direct extension of inflammation affecting the optic nerves.

On examination pus can be seen above the choana descending into the nasopharynx. The ostium can sometimes be found through the nares after cocainizing the middle turbinate.

To open the sinus, the whole of the middle turbinate must be removed, and one blade of a punch forceps in which the blades are at right angles to the shaft, entered through the ostium and turned downward. The anterior wall is then cut away. There is sometimes troublesome hemorrhage from this operation.

When the posterior ethmoid cells are involved they should be removed before opening the sphenoid.

The sphenoid may also be opened after removing the ethmoid labyrinth in Killian's operation. The roof of the sinus must always be carefully avoided in probing or operating in the cavity.

CHAPTER VIII

TUMORS OF THE NASAL AND ACCESSORY CAVITIES

SPURS and ridges of the septum, sometimes called exostoses and enchondroses and nasal mucous polypus, have already been described, and should not be classed as tumors.

ANGIOMA OF THE SEPTUM

This growth may vary from a minute vascular elevation, to a tumor of considerable size and area. If extensive it may be mistaken for sarcoma but is readily distinguished from it by microscopic examination. The growth should be removed as completely as possible and the base cauterized with the galvanocautery.

DENTIGEROUS CYST

Starting from the interior of the alveolar process about the root of a tooth, this cyst slowly grows in size, absorbing bone, and invading the antrum, sometimes appearing on the hard palate, externally in the region of the nasal ala, and internally on the floor of the nose. The contents are a yellow fluid. After the cyst has appeared above the surface of the bone, its walls feel to the finger like very stiff and thick paper.

The cyst with its lining membrane should be dissected out. The cavity thus formed may then ultimately nearly disappear.

TUBERCULAR TUMORS

The septum is sometimes the seat of a tubercular tumor, described under tuberculosis.

BULLOUS MIDDLE TURBINATE

The middle turbinate of one or both sides is sometimes very large, globular in shape, filling the middle meatus. It may extend downward to the nasal floor. After



FIG. 34.—Bullous middle turbinate (from Zuckerkandl).

removal, this mass is found to consist of the middle turbinate bone containing a central cavity with thin bony walls. The cavity is lined with epithelium and is generally empty. Formerly this was called cystic middle turbinate, and supposed to be a bone cyst. It is now

recognized as a *misplaced ethmoid cell*, which has developed in the middle turbinate bone. It has an ostium communicating with the middle meatus, but this is not often easy to find. It is distinguished from a polypus or neoplasm in being hard to the touch, immovable, and attached by a thin bony connection to the ethmoid bone above. It may obstruct breathing on account of its size.

Treatment consists in removing it with a snare ecraseur, which is generally easily done. If shaped so that the loop will not engage it, it may be broken into and the walls removed with the punch forceps.

MUCOCELE

This is a tumor of cystic character, arising from the mucous membrane of one of the accessory sinuses, generally the frontal or anterior ethmoid. It consists of a more or less viscid mucoid fluid, yellow in color, inclosed in a distinct membranous cyst wall. As it increases in size it fills different parts of the accessory and nasal cavities and by absorption of part of the bony partitions it may encroach upon the orbit or cerebral cavity, or protrude on the forehead as a soft fluctuating tumor. In the latter case the edge of the perforation through the frontal bone can be felt. The eyeball may be pushed downward and forward, if the tumor has perforated the orbital roof or the os planum. The cyst may become acutely inflamed, after which the contents will contain pus.

The tumor sometimes ruptures spontaneously in the nose. If untreated it may become serious or fatal by extension to the eye or brain.

Treatment consists in opening the cyst and establishing good drainage into the nose from the cavity which it has formed. It may be possible to do this by intranasal operating, but if the tumor originated in the frontal sinus, an external operation will probably be necessary, the details depending upon the size and position of the swelling. It must be remembered that the inner table of the skull may be perforated and the frontal lobe pressed upon by the tumor, and therefore the operation must be treated as an intracranial one. The floor of the frontal sinus and the frontoethmoidal cells must be removed, to insure good drainage.

MALIGNANT TUMORS

Carcinoma in this region generally arises in the antrum, and by direct growth extends to the nasal cavity and later to the orbit, mouth, and cheek, absorbing bony partitions. It bleeds easily and is often painful. It should be suspected, especially in elderly persons, when there is pain in the cheek, and the antrum is opaque to transillumination. If the tumor has appeared in the nasal cavity, it is generally easy to remove a piece for microscopic examination.

Sarcoma may grow from the septum or from an accessory sinus, and may appear early in life. It is not common.

These tumors if not too extensive can sometimes be entirely removed by a thorough operation with a fair chance

that they will not recur. When this is not possible a palliative operation may be justifiable.

NASOPHARYNGEAL POLYPUS

A nasal polypus originating in the posterior ethmoidal region, or in the antrum, may grow backward into the nasopharynx, filling a large part of it and extending downward even into the oropharynx. If large, it may lose its characteristic glistening, white appearance, and become red, especially that part seen below the uvula. A differential diagnosis must be made between it and a nasopharyngeal fibroma. A polypus is softer in consistency, it is attached by a long slender pedicle and is consequently movable. Its attachment is frequently within the antrum, out of the ostium of which the pedicle comes. It may be the only polypus present, and is often partially cystic.

Treatment.—The polypus may be easily removed by the following method. The nasal cavity is cocaineized, a blunt hook or bent probe is passed through the anterior nares and hooked around the pedicle, which can then be severed with a knife or scissors. At the moment that it is cut, care must be taken that the patient's head is bent forward and that he holds a full breath until the tumor can be removed from the nasopharynx.

FIBROMA OF THE NASOPHARYNX

This is a fibroid tumor growing from the basilar process and sphenoid a little to one side of the median line. It

differs microscopically in different cases, being generally a hard, dense, typical fibroma but sometimes softer, of the nature of an angiofibroma. It begins between the ages of eight and fifteen, for the next few years it continues to grow and to recur after removal; it then stops growing, and finally shrinks and disappears. It is more common in boys than in girls. The attachment of the tumor is broad, extending along the sphenoid into the nasal cavity but seldom far onto the lateral or posterior wall of the nasopharynx. The tumor itself grows slowly in two directions, a rounded mass fills the nasopharynx, while an anterior projection grows forward into the nasal cavity, where it may absorb the bone which separates the accessory sinuses, invade them and the orbit, and protrude through the canine fossa. In extreme cases it may appear as a tumor on one side of the face.

The symptoms are obstruction to breathing, unilateral at first, in some cases periodic hemorrhage, which may become serious, and the presence of a hard, rounded tumor in the nasopharynx and in the nasal cavity. In the latter place it often appears white and may be mistaken for a nasal polypus, but can be distinguished from it by the position of its attachment and its dense structure.

As total extirpation is practically impossible the problem of treatment is to keep the tumor within limits in which it does not threaten neighboring parts, until its period of growth has passed.

Treatment consists in removing as much of the tumor as

possible, and as often as is necessary to keep it from injuring neighboring structures. The following operation is recommended. Under ether a loop of stout wire is passed through the nostril of the affected side into the pharynx where with the help of the fingers it is placed around the attachment of the tumor. The ends of the wire are then threaded into an ecraseur, and the loop very slowly drawn in. In some cases most of the growth can be removed in this way and by slow turning of the screw, bleeding largely controlled. If bleeding becomes troublesome, the wire must be drawn in quickly, the growth removed, and the nasopharynx packed with gauze. Portions which can not be included in a wireloop may be removed with biting forceps, or by evulsion. The bleeding is sometimes profuse, and has been, in a few cases, fatal. If the tumor has invaded the antrum, this cavity may be opened through the canine fossa and an additional point of attack thus gained. The older method of reaching the growth, by resection of the face, or of the palate, is seldom necessary or advisable. The hemorrhage both at the time of operation, and secondary to it, may be severe, and must often be controlled by packing. This increases the danger of sepsis, which may extend to the base of the brain. After as much as possible of the growth has been removed by operation, it is better not to interfere with it frequently as this may tend to induce irritation and bleeding, but any recurrence which can be reached with a wire loop should be removed.

Good results have been reported from injecting portions of

the tumor with monochloroacetic acid, causing local sloughs; also from electrolysis, where it has been possible to reach the growth with needles, but these methods can not be depended upon, and should be used only when surgical removal is contraindicated.

The prognosis depends upon the rapidity of the growth, the tendency to hemorrhage, the age of the patient and the extent of the tumor. Several operations may be necessary. It is serious on account of danger from hemorrhage, and the severity of the necessary operations. If untreated there is danger to vision and often to life from the extension of the growth. Under proper observation and treatment, lasting if necessary several years, the prognosis is fairly good.

CHAPTER IX

ANATOMY OF THE PHARYNX

THE pharynx is a cavity lying in front of the vertebral column, and connecting the nasal cavities with the larynx, and the mouth with the esophagus. It therefore forms a part both of the respiratory and of the digestive tracts. It is divided by the soft palate into the nasopharynx and the pharynx proper.

The **nasopharynx** extends from the basilar process above to the soft palate below. Anteriorly the two nasal cavities open into it through the two choanæ separated from each other by the posterior margin of the septum. The posterior wall is in close relation to the bodies of the upper vertebræ. On each side the Eustachian prominence projects into the cavity, and between this and the posterior wall is the fossa of Rosenmueller. Below it opens directly into the oropharynx, except when it is cut off from it by the elevation of the soft palate. The cavity is lined with mucous membrane, with cylindrical ciliated epithelium, and is sensitive to the touch. The upper, posterior and lateral walls contain lymphoid tissue, the upper part of the ring of Waldeyer. During childhood the pharyngeal tonsil occupies the vault, but during adolescence it diminishes in size and in adult life is but a remnant.

In the middle line of the upper part of the posterior wall is a depression, the *pharyngeal bursa*, which sometimes contains the vestige of a supernumerary hypophyseal gland.



FIG. 35.—Diagram of the oropharynx and adjacent structures. M, Masseter muscle; P, Parotid gland; D, Digastric muscle; IJ, Internal jugular vein; V, Vagus nerve; IC, Internal carotid artery; EC, External carotid artery; SH, Stylohyoid muscle; SP, Stylopharyngeus muscle; IP, Internal pterygoid muscle; SC, Superior constrictor muscle; PP, Palatopharyngeus muscle; PG, Palatoglossus muscle; B, Buccinator muscle; RG, Retropharyngeal gland; PS, Pyriform sinus; T, Faucial tonsil; LT, Lingual tonsil; E, Epiglottis; G, Glottis.

Abnormalities.—The size and shape of the nasopharynx varies in different skulls, but marked deformities are rare.

The posterior border of the septum is practically always symmetrical.

The choana on one or both sides is in rare instances closed by a congenital thin, bony plate, shutting off the nasal cavity from the pharynx.

On the posterior wall a portion of the body of a vertebra may project into the cavity, and is sometimes mistaken for an adenoid or other tumor.

The **soft palate** is a muscular curtain, the principal function of which is that of a double valve, to shut off the oropharynx from the nasopharynx and from the cavity of the mouth. The levatorpalati and tensorpalati muscles raise the palate, the azygos uvulæ elevates and shortens the uvula. The palatoglossus muscles, forming the anterior pillar of the fauces, pull the free margin of the palate to the base of the tongue, separating the mouth from the pharynx. The palatopharyngeus muscles forming the posterior pillars arching from the ridges of the uvula merge into the constrictor on the sides of the pharynx. During the act of swallowing or of gagging their insertions are carried by the contraction of the constrictor from the sides to the back wall of the pharynx, and they thus aid in closing the nasopharynx.

The **uvula** is a pendulous tag in the middle of the free edge of the palate. It helps to close the nasopharynx when the palate is elevated.

Another function of the uvula is to act as a drip, directing the secretions from the roof of the soft palate in front of

the epiglottis and thus preventing them from dropping into the laryngeal cavity.

The **pharynx**, exclusive of the nasopharynx, begins at the soft palate and merges into the esophagus below. It is subdivided into the *oropharynx* and *hypopharynx* or *laryngopharynx*.

Behind the pharynx are the bodies of the cervical vertebræ, on the sides are the deep structures of the neck, and in front the mouth, base of the tongue and the larynx. The lining of the cavity is of mucous membrane with squamous epithelium. The faucial tonsils lie in front of the posterior faucial pillar, the lingual tonsil on the base of the tongue, and there is a varying amount of lymphoid tissue in the lateral folds just behind the posterior pillar, and scattered over the posterior wall.

Under the mucous membrane are the constrictor muscles. The larynx occupies the lower portion of the pharyngeal cavity, the epiglottis extending up behind the base of the tongue to which it is bound by a ligament. During respiration the cricoid cartilage, carrying the arytenoids, is in contact with the posterior or vertebral wall in the middle line, while on the sides the pharynx ends in the pyriform sinuses which merge into the esophagus.

The pharynx has two distinct functions, one to convey air between the nasopharynx and the larynx, and the second to carry food from the mouth to the esophagus. While acting as a respiratory passage, the soft palate is relaxed, the glottis is open, the esophagus is closed and

the pharyngeal cavity is generally shut off from the cavity of the mouth by contraction of the palato-glossus muscle. While acting as part of the digestive tract during the act of swallowing, the nasopharynx is shut off by elevation of the soft palate, and contraction of the superior constrictor muscle, the larynx is closed by its adductor muscles, and drawn upward toward the hyoid bone while the food is propelled by the constrictor muscles into the esophagus.

CHAPTER X

THE TONSILLAR RING

ENCIRCLING the cavity of the pharynx is a ring of lymphoid tissue developed in the pharyngeal mucous membrane, sometimes called the *ring of Waldeyer*. Certain parts of

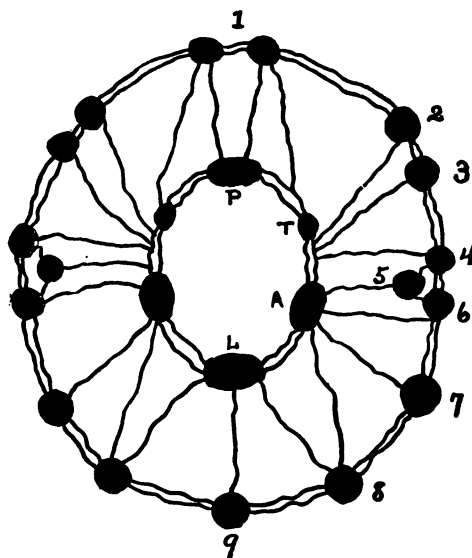


FIG. 36.—Diagram to show the lymphatic drainage of the different parts of Waldeyer's ring (after Escat). P, Pharyngeal tonsil; T, Tubal tonsils; A, Faucial tonsils; L, Lingual tonsil.

The lymphatic glands into which they drain are: 1, Retropharyngeal; 2, Styloid; 3, Lateral pharyngeal; 4, Behind sternomastoid; 5, Bifurcation; 6, In front of sternomastoid; 7, Angle of jaw; 8, Hyoid; 9, Subhyoid.

this ring become well-defined structures of which four are of special importance; the single pharyngeal tonsil at the apex of the ring in the pharyngeal vault, the two faucial tonsils, one on each side between the pillars of the fauces, and the single lingual tonsil at the base of the tongue. Other parts of the ring are represented by lymphoid tissue about the Eustachian tubes, in the fossæ of Rosenmüller

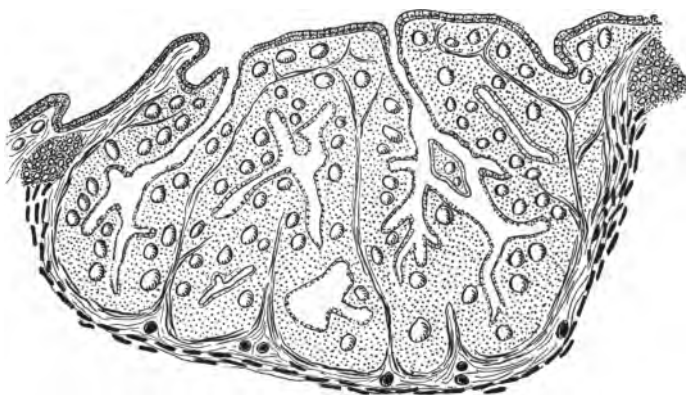


FIG. 37.—Diagram of a section of a faucial tonsil, showing crypts, follicles and capsule. This tonsil is of the submerged type, and the crypts irregular and dilated (Barnes).

along the lateral fold of the pharynx, and often in small islands irregularly scattered on the posterior pharyngeal wall. The development of the tonsillar ring begins in fetal life, and continues in childhood. In the second decade of life the upper part of the ring largely disappears, while the lower portion remains although tending to become gradually smaller.

The different tonsils are developed from the mucous membrane by invaginations of the epithelium which ultimately become the crypts. These vary in size from an almost microscopical duct in a small isolated gland in the mucous membrane, to the deep clefts of an adenoid, or deep subdivided pockets of the faucial tonsil. This system of crypts communicates with the external surface and penetrates to the bottom of each tonsillar mass. Around these crypts, lymphoid tissue is deposited, and between them interstitial connective tissue extends from the supporting mucous membrane.

The **physiology of the tonsillar ring** has long been a mystery. Its position around the open portals of the nose and mouth, its constant presence, its development and involution at fixed periods of life suggest a function, either distinct in itself, or contributory to that of the lymphoid tissue in other parts of the body. The physiological function most frequently ascribed to it is that of protecting the body against infection, especially in childhood, when this protection is most needed. It is possible that pathogenic bacteria caught in the crypts may be used to stimulate the formation of immunizing agents to protect the body against systemic invasion by similar micro-organisms or their toxins. On the other hand removal of a large portion of the ring, as is often done in adenoid and tonsil operations, has not been shown to produce any decided effect upon the body. No operation can remove all of the lymphoid tissue in the pharyngeal mucous membrane, but a large proportion of

it is frequently taken away with apparently nothing but advantage to the patient. If the larger tonsillar masses are removed early in life, the outlying parts of the ring appear to be stimulated to growth, suggesting a vicarious enlargement. As the age of the child advances, this tendency diminishes and disappears. This suggests that the younger the child, the more important to him is this lymphoid tissue.

Pathogenic bacteria brought in by inspiration may easily reach the crypts of the adenoid in the nasopharynx while those contained in food during the act of swallowing may be caught by the faucial and lingual tonsils. It is interesting to note that that part of the tonsillar ring which may theoretically be supposed to protect the body against air-borne contagion disappears after childhood, whereas the part which surrounds the digestive tract persists.

The amount of lymphoid tissue in the different parts of the tonsillar ring varies at different ages and in different individuals. The great majority of normal children have more adenoid tissue in the vault and larger faucial tonsils than is generally supposed. A pharyngeal tonsil of considerable size is normally present in the vault, up to the age of nine to twelve years, and remnants can be seen until the age of twenty to twenty-five, after which it should no longer be visible in the rhinoscopic picture.

The faucial tonsils develop later than the pharyngeal tonsils. In childhood they normally weigh from thirty to fifty grains each, but after this period they vary greatly

in size in different persons. They may be so buried in the soft palate that their presence is not suspected, while on the other hand many tonsils project so conspicuously into the fauces that they give the impression of being larger than they really are.

The lingual tonsil develops later than the faucial tonsils, it is of moderate size in childhood, but in adult life it varies much in different persons.

The lymphoid tissue of the rest of the ring, including that in the lateral pharyngeal wall, and the scattered follicles on the posterior wall, generally reaches its greatest development in childhood also, after which there is a slow involution of the glandular elements.

ADENOIDS

The terms "adenoid," "third tonsil," and "Luschka's tonsil" are sometimes used to describe the pharyngeal tonsil. The terms "adenoids" and "adenoid vegetations" generally imply some pathological condition of this structure. Limiting the use of the word "adenoids" to the latter meaning a pharyngeal tonsil becomes adenoids if it is responsible for any pathological symptoms. A child may be said to have adenoids if the pharyngeal tonsil is larger than is normal for his age, or if with a moderate amount of lymphoid tissue in the vault, his symptoms are due to it. An adult is generally said to have adenoids if an appreciable amount of lymphoid tissue remains in the nasopharynx. The pharyngeal tonsil is so situated that it

may easily become an obstruction to the free passage of air through the nasopharynx. The obstruction may be so slight and temporary that no serious harm comes from it, but it may be the cause of symptoms which urgently demand relief. This occurs almost exclusively in childhood because after that period not only does the adenoid become smaller,

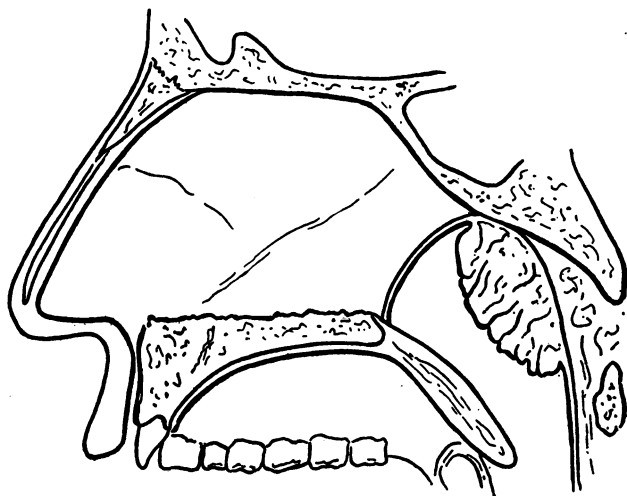


FIG. 38.—Position of the pharyngeal tonsil in the vault of the pharynx.

but the vault becomes so much larger that obstruction to breathing is seldom possible. The actual size of the adenoid is of little importance compared to its relation to the size of the nasopharyngeal cavity. In addition to obstruction of the vault, other symptoms may be caused by the adenoid, most of them secondary to the obstruction, although sometimes due to disease of the gland itself.

The cause of adenoids is not well known. It occurs more frequently in some families than in others. It may be present at birth, but reaches its greatest frequency between four and eight years of age. It is often associated with the narrow type of face in which the palatal arch is narrow and high, the upper teeth crowded, and the nasal cavities narrow. These developmental peculiarities do not become well established before the second dentition, and are often attributed to the effects of mouth breathing from obstructing adenoids. In patients with this type of face, any enlargement of the pharyngeal tonsil will cause obstruction more readily than in the broad type of face. There has been much discussion on the influence of adenoids in the development of the face, and it is generally agreed that although other factors are more important the presence of adenoids during the growing period will tend to impede the development of the nasal cavities and the upper jaw.

As the adenoid increases in size the space between it and the soft palate diminishes, and the air passage becomes obstructed, at first at night only when the palate is relaxed. Breathing becomes noisy or snoring and the child is restless. These symptoms are increased during a cold in the head. If the hypertrophy continues the child may breathe through the mouth all of the time, the face becomes stupid looking and drawn, and a characteristic facies develops.

Obstruction to normal breathing may interfere with sleep and with the general health of the child. He may become anemic, dyspeptic, nervous, dull and badly de-

veloped. Catarrhal secretions are retained by lack of proper drainage in the vault and may lead to chronic infection. The ears may suffer serious damage from obstructed ventilation or secondary inflammation, and the eyes may become affected through the circulatory or nervous system.

It is well to remember that adenoids is not the only condition which may obstruct nasal respiration in children, or cause aural or catarrhal symptoms. Deviations of the septum, eczema of the vestibule, chronic rhinitis, vasomotor rhinitis, and other disturbances should be noted if present, and proper allowance made for them.

In the absence of obstruction to breathing the question often arises whether in a certain case such symptoms as nasal catarrh, anemia, dyspepsia, asthma, enuresis or mental dulness are due to adenoids. They may arise from some chronic infection fostered by the adenoid, but it can seldom be positively affirmed that such is the case.

In adults adenoids seldom obstruct nasal breathing. They may, however, cause post-nasal irritation and secretion, and possibly be the source of septic absorption. As their presence in the adult vault is an abnormal condition, they should be removed whenever they are suspected of causing any symptoms.

Examination.—Since a pharyngeal tonsil is practically always present in childhood, a diagnosis of adenoids should not be made unless it is large or in some other way abnormal. Consequently the patient's symptoms are as

important in deciding the question of operation as the examination.

It is often possible to see the nasopharynx with the rhinoscopic mirror. The pharyngeal tonsil appears on the pharyngeal vault above the nasal septum, except that if it is sufficiently enlarged, it hides more or less of the septum from view, leaving in extreme cases little or no space between itself and the soft palate. When the nasopharynx can not be seen by posterior rhinoscopy, it is often possible with practice to see the adenoid through the nose provided the septum is straight and the lower turbinate contracted with cocaine.

The practice of putting a finger into a child's vault without an anesthetic for diagnosis is to be condemned. If



FIG. 39.—An adenoid as seen in the rhinoscopic mirror.

the child is a normal one he has something there, and whether it should be removed or not can be better judged in other ways. Also it may cause a serious nervous or psychological shock to the child. If a diagnosis can not be made by inspection, and if the symptoms point toward adenoids it is proper to give gas or primary ether for diagnosis, being prepared to remove the adenoid at the same

time. If the tonsils are to be removed, the diagnosis of adenoids may be left until the child is under ether.

Treatment.—The only effective treatment for adenoids is to remove them. They should be removed if they obstruct nasal breathing or if other serious symptoms can be attributed to them. The good results of the operation, especially in cases of marked nasal obstruction, are so striking, and any bad results so rare, that it is often justifiable to advise it for remote symptoms. But it should be borne in mind that in the absence of obstruction, such symptoms as asthma, enuresis, dyspepsia, anemia, mental dulness, impediment in speech, and poor facial development are relieved in only a comparatively small proportion of cases.

The operation may be done under gas or ether anesthesia, with the child in the sitting or in the recumbent position. With the mouth gag in position, an adenotome of a size corresponding to the size of the vault is inserted and as much as enters the fenestrum of the guillotine is cut away.

The fossæ of Rosenmüller and the lateral walls may be cleared by the curette or the finger nail. The vault should be thoroughly explored with the finger and any remnants that are left should be removed.

Bleeding is at first profuse but stops readily. With the patient's head bent forward most of the blood comes out through the nose and mouth, that which goes into the pharynx is swallowed. In order to protect the larynx and trachea from danger of inspired blood and secretions, the

patient should never be allowed to become cyanotic during the progress of the operation. As long as the patient is of good color the normal reflexes will protect the larynx. The lower pharynx should not be allowed to become filled with any considerable amount of blood or mucus.

If the faucial tonsils are to be removed, this should be done first. Tonsillectomy is a more serious operation than the removal of adenoids.

THE FAUCIAL TONSILS

The faucial tonsil is developed from the mucous membrane of the tonsillar space, a pocket between the anterior and the posterior pillars of the fauces. The deeper layer becomes the *capsule*. If the tonsil in its growth gets out of the pocket, it will project into the pharynx with a relatively small attachment. If, on the other hand, the growing tonsil is more or less confined within the pocket, a portion only of its surface will show at the pocket's mouth and its attachment or capsule will cover a large part of its surface. In this latter case most of the tonsil will be lost to view in the body of the soft palate. It is then said to be *submerged*.

Tonsillar tissue grows from the whole interior of the pocket except the extreme upper portion. Here there is left between the tonsil itself and the roof of the tonsillar space a cul-de-sac, the depth of which will correspond to the depth of the pocket into the body of the palate, being deeper the more the tonsil is submerged. This cul-de-sac is called the *Supratonsillar Fossa*.

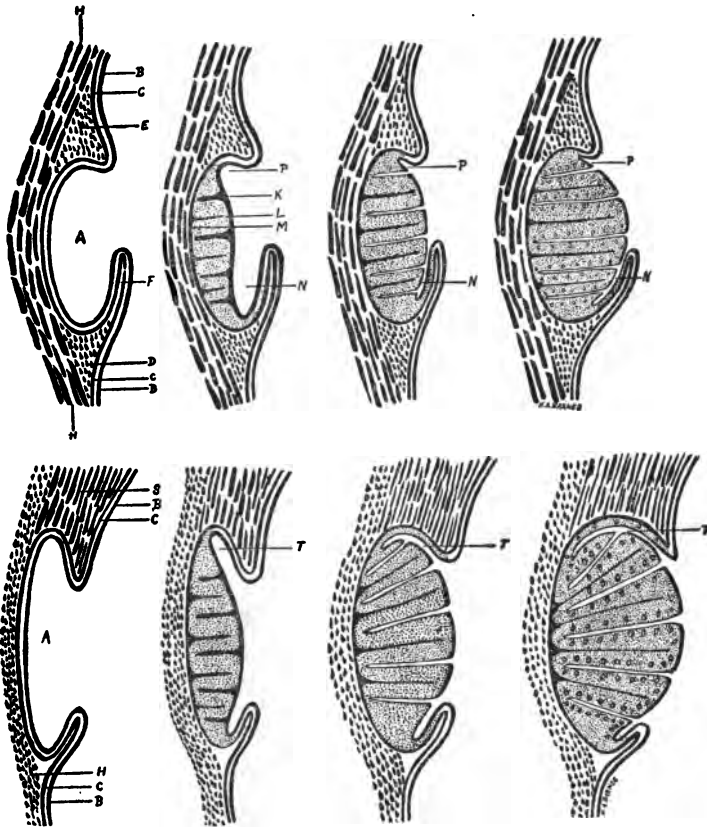


FIG. 40.—Diagrams illustrating the development of the tonsil (Barnes). The left-hand figure in each row represents the sinus tonsillar at the fourth month of fetal life before the appearance of tonsillar tissue. The succeeding figures show the gradual development of the tonsil and explain the relationship which it assumes to the surrounding tissues. The upper four figures are in cross section and show the development of the tonsil and plica. The lower row, in longitudinal section shows the development of the tonsil and the formation of the supratonsillar fossa. A, Sinus tonsillar; B, Faucial epithelium; C, Fibrous mucosa; D, Muscle fibers of anterior pillar; E, Posterior pillar; F, Plica triangularis; H, Superior constrictor of the pharynx. K, Epithelial bud—the anlage of the crypt; L, Fibrous trabecula springing from M = the capsule; N, Anterior fossa; P, Posterior fossa; S, Muscle fibers; T, Supratonsillar fossa.

The tonsillar crypts subdivide the whole mass of the tonsil and penetrate to the capsule. They are lined with epithelium, and surrounded by the lymphoid tissue which constitutes the parenchyma of the tonsil. The network of crypts is in free communication with the pharyngeal cavity, through several round or oval openings on the surface of the tonsil. The drainage of the crypts is better the less the tonsil is submerged. In a submerged tonsil a considerable number of the crypts may open into the supra-tonsillar fossa.

The follicles are a part of the lymphoid tissue in which the reticulum assume a definite form. They are small, round bodies situated just beneath the epithelium of the crypts.

The **tonsillar capsule** is a fibrous fascia developed from the deeper part of the mucous membrane of the tonsillar space. Externally it forms the attachment of the tonsil to the side of the pharynx, and internally it supports the interstitial tissue and vascular supply between the crypts. It is in close relation with the superior constrictor, the palatoglossus and the palatopharyngeous muscles.

The **plica tonsillaris** is a fold along the margin of the tonsillar space composed of mucous membrane externally and tonsillar capsule internally. It may be rudimentary. When large it merges above into the anterior pillar in such a way that the latter looks as if it had been diverted from its proper course and become a sling for the lower lobe of the tonsil. The mucous membrane and the capsule are loosely attached to each other, so that in cutting through

the mucous membrane only, the white, glistening capsule is brought into view and the two can be separated from each other by blunt dissection.

A second or posterior plica connected with the posterior pillar is sometimes present, though rarely prominent.

The faucial tonsils are present at birth, and increase during the first years of childhood, reaching their full

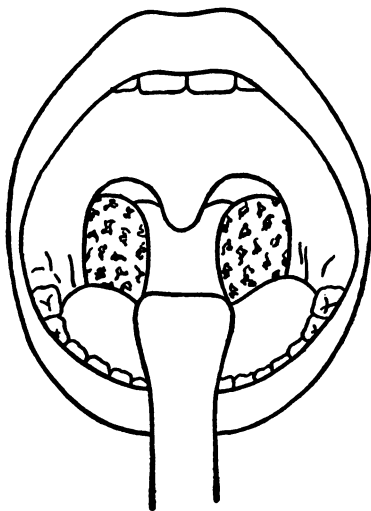


FIG. 41.—Large prominent tonsils.

development later than the pharyngeal tonsil. Between the fifth and tenth year a tonsil weighs normally thirty to sixty grains, it is seldom smaller and only occasionally much larger. At the end of childhood a tonsil should stop growing, and involution should begin. The involution as compared with that of the pharyngeal tonsil is much slower,

much less constant, and seldom complete although in adults there may be only a trace of lymphoid tissue left. Sometimes in childhood or early adolescence the tonsils increase in size and may become very large, in which case their subsequent decrease in size by involution is often very slow. Consequently the size of the tonsil in adults varies

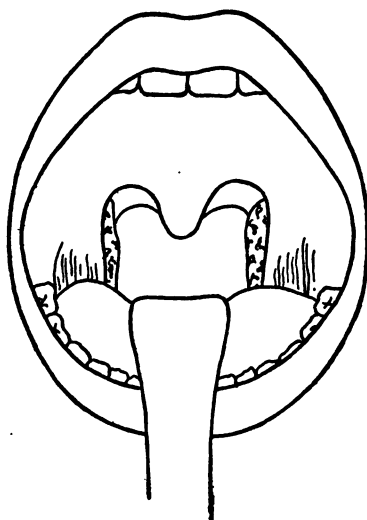


FIG. 42.—Tonsils of the same size as in the preceding figure but submerged or buried in the palate.

much more than in children. The appearance of the tonsils on examination is often very misleading. If they project beyond the plane of the pillars moderate sized tonsils may look very large; if they are submerged in the soft palate they may look much smaller than they really are.

The normal growth of the tonsils in relation to the weight

of the child is greater during the first two years and about the same up to ten or twelve years of age.

Pathology.—In certain diseases such as acute tonsillitis, hyperkeratosis, and often in simple hypertrophy, the faucial tonsils participate in a general disturbance of the whole tonsillar ring. In more indefinite conditions of acute and chronic inflammation and in local infections, the relatively poor drainage and large mass of the faucial tonsils make them more often the seat of pathological processes than is the case with the rest of the ring.

Diseases of the tonsils may be grouped into acute and chronic, the former including acute tonsillitis, and peritonsillar abscess, and cases of acute local infection such as diphtheria and Vincent's angina. The chronic diseases include hypertrophy, keratosis and cases of periodic inflammation or septic absorption. If the tonsil allows infection in any way to pass through it into the general system, it must be looked upon as pathological.

Syphilis, tuberculosis, sarcoma and carcinoma may attack the tonsil.

ACUTE TONSILLITIS

Typical acute tonsillitis presents a fairly definite clinical picture. It is characterized by a sudden onset with chill, rise in temperature, general malaise, and an inflammation of the lymphoid tissue of the whole tonsillar ring with exudate in the crypts and, if no complications arise, a rapid convalescence and recovery.

This clinical history suggests that the local outbreak in the tonsillar ring is a secondary eruption to some constitutional process rather than a local sepsis spreading from an infected focus in a tonsil. Some persons appear to be especially susceptible to it. The disease is often looked upon as contagious, but as a rule the contagion does not appear to be air-borne even in close contact. An attack of tonsillitis does not appear to give any long immunity against future attacks. It may occur at any age, but is less common in childhood and after middle life.

Acute tonsillitis may appear as an epidemic from an infected food supply, especially milk. In these epidemics the clinical history of the cases may vary more or less from that of typical tonsillitis. It may be more virulent, more liable to secondary and even fatal complications, peritonitis, abscess and general sepsis. In these cases the infection apparently enters through the digestive tract and after an incubation period of about two days produces constitutional symptoms, an eruption in the tonsillar ring, and sometimes infection in other parts of the body. This disease is also known as septic sore throat. The micro-organism suspected of being responsible is one of the family of streptococci. Persons whose tonsils and adenoids have been previously removed are not exempt from the outbreak in the rest of the tonsillar ring and from the constitutional symptoms.

Fränkel first called attention to the fact that an attack of acute tonsillitis sometimes follows an intranasal operation

or nasal inflammation. He suggested that the nasal cavity might be the point of entrance for the infection and the tonsillar ring the secondary point of outbreak.

Acute tonsillitis may resemble diphtheria, especially if the exudate covers the surface of the tonsil, or if the lymphoid tissue in the lateral folds of the pharynx is affected. It is distinguished by its rapid onset, by being confined to lymphoid tissue and by the absence of the Klebs-Löffler bacillus in culture.

At the onset of scarlet fever there is frequently an outbreak in the tonsillar ring similar to acute tonsillitis.

The symptoms of acute tonsillitis vary in severity in different cases. The temperature averages about 103 degrees Fahrenheit at its highest, and returns to normal in two to four days. There is often considerable constitutional disturbance and general prostration which may continue for several days. The local manifestations of the disease are swelling, redness and tenderness of the glandular structure of the tonsillar ring, with the formation of white exudate within the crypts. The whole ring may become affected at once, or one part some hours before another. The local symptoms will generally be most marked in that part of the ring which contains the largest amount of lymphoid tissue, in most cases the faucial tonsils.

In the faucial tonsils the exudate appears on the surface through the orifices of the crypts, forming the characteristic white spots. These may coalesce into a pseudo-membrane,

resembling that of diphtheria. Over the pharyngeal tonsil the exudate appears in perpendicular lines following the slit-shaped openings of the crypts, and more frequently than in the faucial tonsils forms a pseudo-membrane. In the lingual tonsil and isolated crypts often seen on the lateral and posterior pharyngeal wall the exudate appears as white spots similar to but smaller than those on the faucial tonsils.

As in most persons the faucial tonsils present the largest mass of lymphoid tissue in the tonsillar ring, and as they are the only part of the ring within easy sight, the disease has become associated with them exclusively. But a little observation will show that the whole ring is affected, and that if the adenoid or lingual tonsil is of any size it may be the seat of most of the local trouble.

The general and the local severity of the disease vary much in different cases. As a rule, if there is a large amount of lymphoid tissue in the tonsillar ring the attack, both local and general, will be more severe than if the amount is small.

Treatment.—The patient should be confined to bed. Various internal drugs have been recommended, among them aconite, salicylic acid and guaiacol. Gargles or sprays of mild antiseptic solutions are desirable to keep the cavity of the pharynx as clean as possible. Local applications to the faucial tonsils are often advised but are not altogether rational. The disease is not on the surface and is not limited to the faucial tonsils. Manipulation is uncom-

fortable for the patient and should be confined to those cases where it is believed to be effective.

The course of the disease is generally a short one, often unexpectedly so considering the severity of the local and constitutional symptoms; the convalescence, however, may be slow.

If local tenderness continues after a day or two or becomes unilateral, peritonsillar abscess should be suspected.

In cases which show any signs of formation of membrane or where the onset is insidious, a culture should be taken to rule out the possibility of diphtheria.

SUBACUTE TONSILLITIS

A typical case of acute tonsillitis presents a definite picture, but there are other cases where the lymphoid tissue of the tonsillar ring becomes inflamed with a tendency to the formation of exudate in the crypts. These cases run an irregular or subacute course. Some patients have such attacks periodically combined with more or less general malaise sometimes with digestive, or rheumatic, or neuralgic symptoms with little or no rise of temperature. It is not always easy to judge whether the sore throat is part of the general upset or the cause of it.

It has recently become the custom among many physicians to remove the faucial tonsils in these cases. The periodic attacks often stop after tonsillectomy, sometimes they do not. If the faucial tonsils are the part of the ring more frequently or obviously affected their removal may

prevent the recurrence of these attacks. Sometimes, however, after their removal the outbreaks continue to recur in the remaining lymphoid tissue. It is possible that some of these attacks affect also the lymphoid tissue of the whole digestive tract. In removing the tonsil it is hoped that the source of the trouble is a chronic, infective, faucial tonsillitis, though this can seldom be proved. This subject is described under the head of Chronic Tonsillitis.

For many years a connection has been noted between tonsillitis and rheumatism. It was commonly believed that persons subject to rheumatism were especially liable to tonsillitis, and that the latter might be a symptom of the former. More recently it is held that the tonsil may be the point of entry for a rheumatic infection or infectious arthritis.

PERITONSILLAR ABSCESS—QUINSY

A peritonsillar abscess is the result of suppuration behind the tonsillar capsule. Pus once started in this region follows the capsule in one direction or another. The abscess generally extends upward into the soft palate, often just beyond the supratonsillar fossa, into which it ultimately breaks. It may extend forward toward the anterior, or backward into the posterior pillar, in the latter case sometimes coming to the surface on the lateral pharyngeal wall. It occasionally pushes through the anterior wall of the soft palate and breaks in front of the anterior pillar. In spite of the extent and position of a peritonsillar abscess the pus

is, with very rare exceptions, limited to the palate and tonsillar region. Extension of pus into the deep structures of the neck occasionally occurs, but considering the frequency of the disease this complication is very rare.

Etiology.—The cause of a peritonsillar abscess is the penetration of infection behind the tonsillar capsule. It

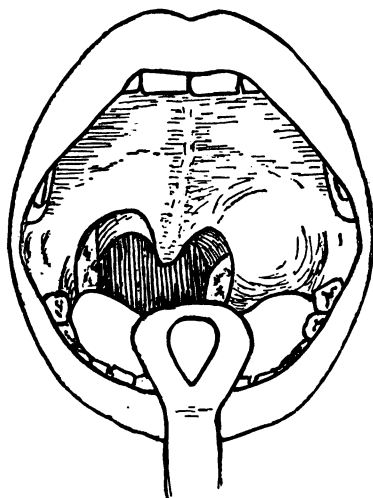


FIG. 43.—Peritonsillar abscess on the patient's left side.

is seldom possible to demonstrate the local reason for this, but as some persons are liable to its occurrence after each attack of tonsillitis or other local infection, the tendency being often limited to one side only, it may be assumed that there is some local weak spot, or open door through the protecting fascia. In appearance a tonsil from which an abscess is liable to start does not necessarily differ from

any other. It is commonly somewhat larger than normal, and often belongs to the submerged type, in which the openings of the crypts are hidden and obstructed.

The *symptoms* are gradually increasing pain on the affected side, pain in swallowing and difficulty in separating the jaws. The temperature varies and increases with the formation of pus. On inspection the soft palate is swollen and the uvula is pushed away from the affected side, as may be seen by following the median line which is visible both on the hard and soft palate. Normally this line on the soft palate is a continuation in a straight line of that on the hard palate, but in case of a peritonsillar swelling the two form a distinct angle. As the abscess increases, the tonsil is pushed toward the median line, and the soft palate on one side becomes bulging and reddened. The duration of the abscess before spontaneous rupture varies, but is often about a week.

After free drainage of the pus the symptoms rapidly disappear, except that an opening made through a considerable depth of tissue may close and the pus accumulate again. The prognosis is good. Although the disease is often very painful it is only in rare cases that the pus does not find its way out near the tonsil and the symptoms subside in a few days.

The pus may at any time break through a small opening, so that it drains slowly, and the symptoms gradually subside. In these cases it is sometimes erroneously believed that the process has been aborted. The patient's symp-

toms, which up to that time have been increasing, begin slowly to decrease and may disappear without any pus being seen.

Treatment.—Gargles of warm alkaline and cleansing solutions should be given. Cold externally may give relief. The essential object in treatment is to open the abscess if this can be done with a reasonable promise of success without subjecting the patient to too great discomfort. A large abscess is generally easily opened, but where the swelling is small it may be difficult to find the pus. It is often a question when to try to open a peritonsillar abscess. An unsuccessful attempt is unsatisfactory both to the patient and the physician. During the first few days if there is little swelling it is often better to wait. If the patient is getting better the pus is probably slowly leaking out, and an attempt to find the little that remains will be unnecessary and very possibly unsuccessful. But if the patient is uncomfortable and becoming more so, and there is reasonable hope of reaching the abscess, it is generally better to make the attempt.

Where the soft palate is swollen but not fluctuating, the supratonsillar fossa will generally offer the best and shortest route to the abscess cavity. The knife is carried around the edge of the anterior pillar above the tonsil into the fossa and a free incision made into the bulging membrane. This is less painful, accompanied by less bleeding, and is less liable to close too soon than an incision through the soft palate, except in those cases in which pus is evidently

near the surface of the palate. Ballenger makes an incision similar to that for tonsillectomy, through the mucous membrane of the plica, and dissects just outside of the capsule until the pus is reached. If the swelling is largely behind the tonsil in the posterior pillar the incision may be made there. It must always be remembered that the large vessels of the neck are outside of the tonsil, behind the line of the posterior pillar, and that this region must be carefully avoided. In those rare cases in which the pus reaches the deep structures of the neck, it should be sought for at once by external operation.

After a free opening the patient usually recovers quickly, but is generally liable to recurrent attacks. This can be avoided by tonsillectomy. In cases of recurrent abscess this operation is often difficult, owing to the adhesions which have formed between the capsule and the adjacent muscles.

Tonsillectomy is sometimes done immediately, thus radically opening the abscess and at the same time insuring against any future attacks.

ENLARGED TONSILS

In children the actual size of the tonsils does not vary as much as is commonly supposed, although occasionally they are much hypertrophied. The apparent difference in size so often noticed is due to their position in relation to the soft palate. Some tonsils project into the pharynx and in extreme cases may almost touch each other in the

median line, yet in spite of their prominence they are often no larger than entirely submerged and invisible ones, and in fact are probably less liable to cause trouble than the latter. After childhood many tonsils remain about the same size or slowly become smaller, some almost entirely disappear while others, during childhood or adolescence, become large and remain so. The enlargement may be a simple hypertrophy, or the tonsil may be also otherwise pathological. A large tonsil may lead to mechanical obstruction and offer opportunity for retaining detritus.

Diagnosis.—In order to judge of the actual size of the tonsils, the extent of their protrusion beyond the anterior pillar is of but slight importance. The outline of the tonsil on both sides of the pillar should be ascertained by inspection or palpation. The distance between the anterior pillar and the alveolus will often indicate roughly the amount of tonsillar tissue submerged in the palate.

The term enlarged tonsils should be used only for such tonsils as are actually larger than normal, and should not include one which is acutely swollen. In children an enlarged tonsil is generally of normal structure and density, but it may hold a large amount of detritus. Sometimes, especially in adults, the hypertrophy is of interstitial tissue and the tonsil is hard and fibrous. In other cases it is soft and friable.

Etiology.—The cause of enlargement of the tonsils is generally obscure. It has been accounted for as due to chronic irritation, unhealthy general conditions or some

acute disease, but this connection is not always easy to trace. It is frequently associated with adenoids.

The symptoms of enlarged tonsils, if any, are a characteristic, throaty voice and a tendency to inflammatory attacks, at which time there is discomfort in swallowing. Obstruction to respiration is much more likely to be due to adenoids than to faucial tonsils.

Normally the tonsil should have become only a remnant in later life. It may, however, continue large, and in the process of involution there may be formed pockets from dilatation of parts of the crypts, in which débris may accumulate.

Treatment.—The only effective treatment for enlarged tonsils is to remove them. If excessively large it is better to remove them even if there are no symptoms, as their presence is a constant invitation to trouble. When the enlargement is of moderate extent the advisability of removing them will depend upon the question of whether they are doing any harm or are likely to do any in the future. This subject is discussed under chronic tonsillitis.

RETAINED SECRETION

Masses of a white substance resembling cheese are very often found in the supratonsillar fossa and in the crypts of the tonsils. Although generally small, these masses may become as large as a pea or larger, especially if the supratonsillar fossa is large or the crypts dilated. This substance is of a uniform color and soft consistency, but may

become decomposed and foul. It is formed in the tonsillar crypts and contains fibrin, bacteria, and detritus. It is commonly called retained tonsillar secretion, and may easily become an ideal breeding place for pathogenic bacteria. In itself, however, it can not be looked upon as pathological or necessarily the cause of trouble on account of its frequency. It may be found in greater or less amount in nearly all tonsils, but occurs especially when they are enlarged or submerged. In these cases the secretion either accumulates in the crypts or, after escaping from them, is caught and retained in the supratonsillar fossa. A mass sometimes appears at the orifice of a dilated crypt, in which case the patient may feel, or see, or taste it.

By directing a stream of air or water, or both, from an atomizer into the opening of the supratonsillar fossa it is often possible to wash out considerable of this material, sometimes large masses of it.

CHRONIC TONSILLITIS

Under this head may be included not only those cases in which the tonsil is obviously pathological, but also those in which it has become an insufficient barrier to either local or general infection. Some tonsils periodically admit infection back of the capsule, causing peritonsillar abscess. In others there may be absorption of micro-organisms or their products into the cervical glands or into the general system, either at the time of acute inflammation of the tonsils or without evident disturbance in them. Es-

pecially in this latter case, the evidence that the tonsil is the portal through which infection has entered must often necessarily be circumstantial only. That the tonsil may become a focus of infection, allowing micro-organisms to collect in its crypts from which under certain conditions they or their products enter the lymph channels and are widely distributed, is generally admitted. It is unfortunately not possible by inspection of the tonsil to be sure whether it is a source of infection; this does not necessarily depend upon its size or upon the amount of detritus which it contains, although both these conditions must be considered. A more important point is the simultaneous appearance of tonsillar inflammation with constitutional symptoms or enlargement of the cervical lymph glands.

That the infections of rheumatism, chorea, endocarditis, and infectious arthritis may find their entrance through the tonsils is evident in some cases and suspected in others. The bacillus of tuberculosis, especially of the bovine variety, is frequently found in the tonsil, and occasionally goes through it to the cervical glands. Sometimes the tonsil itself shows tuberculosis.

The normal tonsil contains pathogenic bacteria in the crypts. As previously explained, the function of the tonsil may be to attract these micro-organisms and from them to elaborate a protective vaccine. Their presence can not be looked upon as pathologic. On the other hand, it has not been demonstrated that the individual suffers any harm from the loss of his tonsils, therefore if there is

reason to suspect that they are the source of infection, they should be removed.

Diagnosis of chronic tonsillitis can not always be made by examination of the tonsil. A so-called ragged looking tonsil is not necessarily pathological. A diseased tonsil may be large or small. It often contains a considerable amount of detritus which can be expressed from the crypts. It may be obviously abnormal in color or consistency, and it may show minute accumulations of pus under the epithelium. But it may appear entirely normal and still be the probable source of trouble. After it has been removed accumulated débris is often found in it which was not seen before operation. The presence of cheesy material, however, is too common to be in itself considered pathological. Considerable detritus or recurring exudate in the crypts is to be looked upon with suspicion.

Treatment.—The only effective treatment for chronic tonsillitis is tonsillectomy. When this is impossible, the supratonsillar fossa and tonsillar crypts may be cleared of their contents by the stream from an atomizer or by a probe. If it is suspected that there is a local focus of infection, this should be cleaned with a two to eight per cent. solution of nitrate of silver on a cotton stick. Applications limited to the surface of the tonsil can have very little effect upon it.

REMOVAL OF THE TONSILS

The conditions under which tonsils should be removed may be summarized as follows:

Tonsils should be removed if serious symptoms can be logically attributed to them. The more serious the symptoms and the more direct the connection, the more imperative is the operation.

They should be removed for recurring peritonsillar abscess.

They should be removed for recurring and persistent cervical adenitis that cannot be accounted for by a focus in the teeth, vestibule, scalp, nose, nasopharynx or ears.

They should be removed for recurring subacute tonsillitis. This does not include those acute infections of the mucous membrane of the upper respiratory tract often accompanied by sore throat, which do not start in and only incidentally involve the tonsillar ring.

They should be removed if it is believed or even seriously suspected that they are the entering point of constitutional infection. While few would dispute this, its practical application in individual cases must be often influenced by different opinions. The tonsils are only one of several avenues through which infection may enter. As it is often the easiest one to close, an experimental operation in serious cases may be justifiable. It is perhaps better to sacrifice many innocent tonsils rather than to allow one guilty one to escape, but it is also true that every unnecessary operation does a little harm to medical science. It is unfortunate that we can never be sure by its appearance that a tonsil is innocent, and not very often that it is guilty.

Very large tonsils should be removed, as experience proves that persons are better off without them.

Tonsils which are wholly exposed may be obstructive and require removal on that account, irrespective of size.

If the tonsils are at fault they should be removed completely with the capsule. It is generally the deeper portion that is the more important to remove.

Tonsils should not be removed for trivial symptoms. Tonsillectomy is not justifiable simply because the tonsils protrude in front of the pillars, nor because they look ragged, nor for occasional sore throat, nor because they contain plugs, nor because the patient is under ether for adenoids, nor for any remote symptoms not of a serious nature, nor to protect the patient from indefinite infection, nor for an occasional attack of simple acute tonsillitis.

Tonsillectomy should be looked upon as a serious operation. As in the majority of cases patients undergo the operation with little disturbance, and the results are apparently all to the good, the removal of the tonsils is not infrequently advised with the feeling that the operation is insignificant and that the tonsils are in themselves a disease. Complications may occur in tonsillectomy, and the convalescence may be very slow.

TONSILLECTOMY

The tonsil is developed from a portion of the mucous membrane of the side of the pharynx. The external layer of this mucous membrane forms the mass of the tonsil,

the inner layer a fibrous membrane called the capsule. The capsule is therefore the attachment of the tonsil to the pharynx. Around the border the capsule merges into the mucous membrane of the fauces. A portion of the capsule often projects into the free cavity of the pharynx, covered with an equal amount of mucous membrane forming the plica tonsillaris. This plica is therefore made of capsule internally and mucous membrane externally, placed back to back. It is possible by careful dissection to cut through the mucous membrane only and thus to reach the outer surface of the capsule.



FIG. 44.—Forceps for seizing the tonsil.

The capsule, except around the border where it joins the mucous membrane, is separated by a little connective tissue only from the superior constrictor muscles and the muscles of the anterior and posterior pillars. This is especially true of the upper lobe; the lower portion is more firmly attached. But as a result of inflammation, especially peritonsillar abscess, the capsule may be bound to its bed by firm adhesions.

Except in unusual cases, if a tonsil is to be removed at all it should be entirely removed. The older methods of operating generally failed to remove the whole mass, and

often left a large part of it behind. Recent methods recognize that a complete operation or tonsillectomy must remove the capsule intact with the tonsil. A general anesthetic is necessary with children. With adults most operators prefer it, although the operation may be done with local anesthesia. The patient may be in the sitting position or lying on the side or on the back, according to the preference of the operator. Under general anesthesia a mouth gag is inserted, and when necessary to see, a tongue depressor also is used. The tonsil is dissected out by drawing it with a tenaculum toward the median line and cutting through the mucous membrane close to the line where it merges into the capsule around the anterior upper and posterior margin of the tonsil, taking care not to cut into the capsule. By pulling the tonsil toward the median line the outer surface of the capsule then appears as a glistening white membrane, except in those cases where adhesions have formed between it and the surrounding muscles. As soon as the operator is well behind the capsule, much or the whole of the subsequent dissection may be

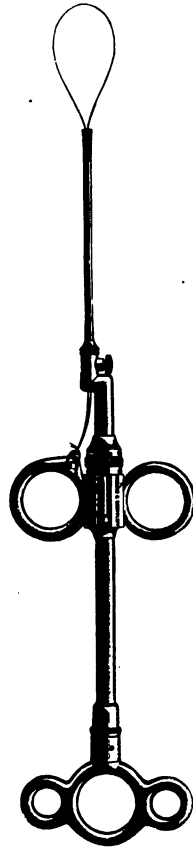


FIG. 45.—Farlow snare, for enucleation of the tonsil.

done with blunt instruments, or with the cold wire snare. The upper lobe is first freed from its bed as above described. The loop of wire is then applied round the lower lobe of the tonsil, and the barrel pushed behind the upper lobe. The wire is then drawn home and follows the capsule, dissecting it from its attachments.

The guillotine, which when used as in the older operations generally only cut the tonsil in two, may if rightly applied cut behind instead of in front of the capsule.

Sluder has shown that by using a guillotine with a blunt edge and a small hole, the whole tonsil, including the capsule, can in most cases be pushed through the ring either by the finger or by the promontory of the mandible. The blunt guillotine then dissects the capsule from its attachments.

Both of these operations require a special technique, and should not be undertaken until the operator has studied them clinically.

Hemorrhage after Tonsillectomy.—Bleeding occurring at the time of operation may continue until some means are taken to stop it. More frequently it becomes noticeable that undue bleeding is taking place either shortly after the operation or several hours, or occasionally a few days after. The possibility of its occurrence must always be borne in mind and the patient kept under observation. Until out of the ether he should be so placed that blood may run out of his mouth and be seen and when conscious he should be warned against swallowing any accumulations in his pharynx. If bleeding continues the source of the

blood must be sought. It has for many years been recognized that there is danger of persistent hemorrhage after the removal of tonsils, either at the time of operation or secondary to it. As the operative field lies between the two pillars, and is stretched with every act of gagging or swallowing by the separation of the posterior and anterior pillar, favorable opportunity is offered for keeping open a vessel.

The control of bleeding is often difficult, it may be hard to see the field and even more so to work, on account of the gagging or biting of the patient, so that a repetition of the general anesthesia may be advisable.

Direct pressure with a gauze sponge may stop the bleeding either temporarily or permanently. This local pressure continued for any length of time is difficult or even impossible for the patient to stand.

Sometimes by careful wiping and inspection the bleeding vessel can be seen, and controlled by torsion, suture or ligatures.

The pressure of an adherent clot in the tonsillar space, which tends to reform if removed, indicates a bleeding artery which is liable to give trouble until it is controlled by a suture.

The main artery of the tonsil enters the tonsillar space high up, and runs downward between the muscle and the capsule before entering the tonsil.

The bleeding if persistent can generally be stopped by sutures. The patient should be etherized and a curved nee-

dispassed from behind forward, through the posterior pillar, the constrictor muscle and the anterior pillar. Three sutures thus placed and tied, obliterate the space made by the removal of the tonsil. They may be removed in three days.

Cases have been reported in which the external carotid has been tied to stop tonsillar hemorrhage.

Astringents, especially adrenalin, are sometimes successful, but faith in astringents often leads to disappointment.

KERATOSIS TONSILLARIS

Keratosis of the tonsillar ring was formerly known as pharyngo-mycosis, under the belief that it is caused by the growth of the mycelium of the *leptothrix buccalis*. It is now generally admitted that the primary condition is one of keratosis of the epithelial cells of the tonsillar crypts, and that the *leptothrix* which is almost constantly present, is only an accidental saprophyte.

The different parts of the tonsillar ring are seen to be studded with white spots, due to plugs projecting from the orifices of the crypts. These may be but few in number or very numerous, and the extent of the projection varies, some reaching an eighth of an inch in length. They are most noticeable upon the faucial tonsils although they are especially frequent upon the lingual tonsil. A few are seen projecting from the lymphoid follicles of the lateral and posterior pharyngeal wall, rarely in the nasopharynx.

It is seen generally in young persons, from sixteen to

twenty-five or thirty years of age. It lasts from a few months to a few years, but as in most cases it produces no symptoms, it is discovered accidentally by inspection of the throat and its period of duration is therefore hard to determine. It ultimately disappears entirely.

The clinical importance of this condition lies in the danger that it may be mistaken for some other disease. The abundant, very prominent white masses projecting from the crypts not only frighten the patient, but often lead to mistaken diagnosis or prognosis by the physician.

It is sometimes mistaken for acute tonsillitis, from which it is easily distinguished in being a chronic and not an acute process, without accompanying inflammation. The white spots are comparatively hard, often markedly projecting and difficult to remove.* The common mistakes in diagnosis are overcome by a knowledge of the existence of such a condition.

Symptoms.—In the majority of cases there are practically no symptoms and the condition is discovered by accident. Sometimes the projecting masses cause local irritation.

Prognosis.—This condition although chronic in its history, disappears within a varying time, from a few months to one or two years. While it lasts it does the patient no harm.

Treatment.—It is seldom necessary or advisable to treat it, especially as no simple treatment will produce any marked effect upon it. It may be necessary to remove periodically the irritating projections.

FOREIGN BODIES IN THE TONSIL

Foreign bodies occasionally find their way into the tonsillar crypts or supratonsillar fossa. Of these the most common are fish bones, bristles of a tooth brush, and small pieces of straw or wood. The characteristic symptom is a pricking sensation on the corresponding side of the pharynx, especially during the act of swallowing. These bodies may not show on the surface, and are often very hard to find.

Concretions or calculi containing lime salts sometimes form around some nucleus in a tonsillar crypt. They may attain considerable size. The diagnosis may be made with a probe if they appear on the surface, or if from swelling and discomfort in the tonsil their presence is suspected. They can generally easily be removed.

Bone in the Tonsil.—The styloid process is sometimes elongated along the course of the stylohyoid ligament as an anatomic anomaly. The tip may then reach the immediate neighborhood of the tonsil or even penetrate it, in which case it may be felt as a bone in the tonsil, or a piece may be removed in a tonsillectomy.

THE LINGUAL TONSIL

The lingual tonsil is in two parts, one on each side of the median line of the base of the tongue. Although present in children it develops later than the rest of the tonsillar ring. It varies much in size in different persons. In adult life it may have disappeared, on the other hand it may be of considerable size. It sometimes sends prolongations laterally

which merge so closely with the lower part of the faucial tonsils that it is difficult to separate them. It has no true capsule, but it is comparatively rich in interstitial tissue, which unites it firmly with the fibrous layer of the lingual mucous membrane. The crypts are smaller than in the other tonsils, and more separated from each other.

The lingual tonsil participates in the diseases of the tonsillar ring, such as acute tonsillitis, keratosis and general hypertrophy.

Hypertrophy of the lingual tonsil is sometimes seen in children with general hypertrophy of the tonsillar ring. It is more common in middle life, when it may be of considerable size, impinging on the epiglottis, and causing sensations of obstruction and irritation, sometimes inducing a dry, hacking cough.

Diagnosis is easily made with the laryngeal mirror. If necessary it may be removed by a special guillotine. This is liable to lead to troublesome bleeding. In most cases the mass can be sufficiently reduced in size by applications of the galvanocautery after thorough cocainization. A cough arising from the lingual tonsil may often be allayed by applications of trichloracetic acid or forty per cent. solution of nitrate of silver.

Abscess of the base of the tongue may originate in the lingual tonsil. It is unilateral and may extend into the sublingual region.

CHAPTER XI

DISEASES OF THE PHARYNX

DISEASES OF THE NASOPHARYNX

THE mucous membrane of the nasopharynx participates in many of the diseases of the mucous membrane of the nasal cavities.

Acute nasopharyngitis often precedes acute rhinitis, or cold in the head. The inflammation starting in the nasopharynx extends both into the nose and downward into the larynx, sometimes also through the Eustachian tubes to the middle ear. It may, however, be limited to the nasopharynx. The symptoms are a sensation of smarting or burning above the soft palate, with a slight amount of secretion.

Chronic nasopharyngitis may be limited to the nasopharynx, in which case it is generally caused by a failure of complete involution and chronic disease of the pharyngeal tonsil. The mucous membrane is reddened and there may be adherent secretion on the posterior wall. If in an adult an appreciable amount of adenoid remains, and there are symptoms of discomfort or secretion, the adenoid should be removed. In the great majority of cases the disturbance in the nasopharynx is secondary to chronic rhinitis. The nasopharynx itself forms but little secretion, but se-

cretion from the nose coming through or adhering to the walls of the nasopharynx gives the false impression that the trouble is there. The symptoms of chronic pharyngitis are a feeling of dryness, and often a post-nasal catarrh or adherent crusts which periodically become detached and fall into the pharynx.

Treatment.—Applications of glycerine and iodine or tannin or nitrate of silver on a cotton stick passed behind the soft palate are often advised, but except in rare instances do not reach the source of the trouble. Irrigation with normal saline solution or an alkaline solution may be made through the fauces or through the nose, but there is always a risk of infecting the middle ear through the Eustachian tube. The patient must be warned never to blow his nose nor to swallow while the douche is passing through the nasopharynx.

Atrophic rhinitis always extends to the nasopharynx and pharynx. The mucous membrane becomes very dry and crusts adhere to the surface. Syphilis occasionally appears in the nasopharynx, generally as a gumma of the posterior wall with a sloughing center and infiltrated edges. After healing there remains a stellate cicatrix.

ACUTE PHARYNGITIS

This is an acute inflammation of the mucous membrane of the pharynx. It may be primary in the pharynx, but is more frequently secondary to bronchitis, rhinitis, gastritis, or some constitutional disease. It varies in severity from a

slight hyperemia, as in most cases of common cold, to a severe, painful, swollen and even phlegmonous inflammation. It may be a more or less virulent infection, or simply a congestion secondary to some other disease. The degree of redness of the mucous membrane is an uncertain guide in diagnosis. The color varies much in different throats, within normal limits, and it may deepen rapidly, as a result of simple irritation or swallowing. Acute pharyngitis should be distinguished from acute tonsillitis, although they may occur together. If exudate is present in the tonsillar crypts it is probable that the tonsillitis is the primary disease. The symptoms of pharyngitis are discomfort or pain especially on swallowing, increased redness, generally diffuse, though sometimes especially marked on the pillars and uvula or about the lymphoid tissue of the posterior pharyngeal wall. Rise of temperature or excessive secretion make it probable that other regions are affected. Any appearance of pseudo-membrane or localized swelling should lead to a suspicion of diphtheria or abscess.

Treatment.—The common treatment of acute pharyngitis is a gargle, either cleansing as Seiler's tablets or astringent. This should be repeated every hour. A more effective cleansing of the pharynx may be done by irrigation with a fountain syringe. The patient should first take a deep breath and hold it while the nozzle of the syringe is placed in the patient's mouth and a gentle stream directed against the posterior pharyngeal wall. If the patient finds difficulty in gargling or in irrigation the same solutions may be used

as a spray in an atomizer. Lozenges of which there are many on the market containing menthol, chlorate of potash, chloride of ammonium or mild astringents, may give relief, but any that might disturb the digestion should be avoided.

CHRONIC PHARYNGITIS

This may be defined as any abnormal condition of the mucous membrane of the pharynx not acute in its course and which can not be classified under a more definite pathological heading. The appearances and the patient's symptoms therefore vary indefinitely. The mucous membrane may become livid, or red, or pale, or dry, or mottled, and the patient's sensations may be described as dryness or burning, or periodical soreness, either general or localized. There is usually a lack of the normal glistening moist surface, and the mucous membrane may be actually dry. Any lymphoid granules on the posterior pharyngeal wall, or in the case of older people the thickened and vascular nodules which have replaced them, are often prominent, and become easily congested. If these spots are especially noticeable the term follicular or granular pharyngitis is often used. To what extent these spots are responsible for symptoms and in which cases they are simply accidental features is not always easy to determine.

As in acute pharyngitis, chronic pharyngitis may be a part of a more extensive disease. In atrophic rhinitis the pharyngeal mucous membrane generally takes part in the disease, this being the principal cause of the so-called

pharyngitis sicca in which the surface loses all moisture, and becomes entirely dry. Chronic pharyngitis is commonly found in connection with chronic disturbance of the digestive tract and in some constitutional diseases, as gout and rheumatism. It is frequently the result of the use of alcohol and tobacco.

Treatment.—Gargles and sprays may be used to soothe irritable mucous membrane. When the trouble is secondary to digestive or bronchial disturbance, these conditions should receive attention.

Granular pharyngitis, also called *follicular pharyngitis*, or *clergyman's sore throat*, is the condition just mentioned in which reddened, slight elevations are seen irregularly distributed over the mucous membrane of the posterior pharyngeal wall. In youth these elevations are small adenoid masses, later in life by the involution of the lymphoid tissue they become patches of congested and thickened mucous membrane. In inflammatory conditions they become more prominent. They may produce no symptoms, in other cases they are the cause of irritation. The common method of treating them is to touch each one with the point of a galvanocautery, or with nitrate of silver.

ELONGATION OF THE UVULA

The mucous membrane of the uvula may become so stretched that it hangs down below the end of the muscle, even into the deeper parts of the pharynx. It is then especially liable to edematous swelling during acute in-

flammation, and this swelling tends to increase the elongation. It may irritate the epiglottis and deeper pharynx and cause cough.

A second form of elongated uvula is a hypertrophy of the whole structure, due to chronic pharyngitis.

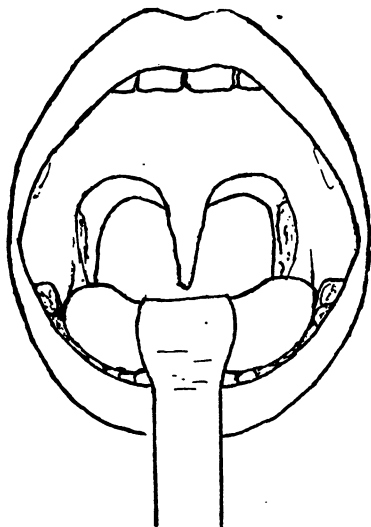


FIG. 46.—Elongation of the uvula.

Treatment.—If an elongated uvula is causing irritation, it should be shortened. In the first form this is done by cutting off the redundant mucous membrane, leaving enough to cover the muscle. A specially devised pair of scissors is desirable because the uvula will slip away from the blades of common scissors as the incision is made. In the second form the scissors should first seize the mucous membrane, and should then be moved up toward the base

of the uvula, so that after the amputation the cut through the mucous membrane will be at a lower level than the deeper tissues, making a cuff to cover the stump. It is better to make the cut on a bevel, the anterior point being below the posterior. A uvula should not be shortened to less than its normal length. If cut off close to the palatal margin there is danger that there may be incomplete closure of the nasopharynx in swallowing and speaking.

The uvula is sometimes bifid. This represents the first stage of a cleft palate in which the cleft does not reach the soft palate. It causes no symptoms.

ACUTE EROSIONS OF THE PHARYNX

Acute erosions of the mucous membrane of the pharynx may arise from trauma, from infection or from herpes. Often an abrasion of the epithelium or wound of the mucous membrane becomes locally septic. The raw surface is covered with a pseudo-membrane made of fibrin, detritus, and bacteria, and the surrounding mucous membrane becomes red, injected and tender. These conditions last until healthy epithelium again covers the lesion. The affected surface increases in size only when the infection is especially virulent, as in diphtheria, or when the resistance of the body is low as in typhoid fever, or when there is added trauma, as in unwise cauterization in the treatment.

Diagnosis.—Acute erosions should be distinguished from the chronic ulcerations of syphilis, tuberculosis and new growths. In most cases of traumatic erosions, the history

will make the nature of the erosion clear. Traumatic and septic erosions should heal steadily day by day. If they tend to remain stationary a cause should be sought for, such as continued local irritation, syphilis or constitutional weakness.

Treatment.—Local cleanliness is the essential of treatment, avoiding irritating agents. Until an acute erosion tends to become chronic it is never advisable to cauterize it. Even then it must be done with care and good judgment.

HERPES OF THE FAUCES

Herpes of the fauces resembles herpes of the skin only in its etiology, a disturbance connected with the local nerve supply. On mucous membranes the eruption appears first as small circular vesicles from which the epithelium soon disappears, leaving circular erosions. These vary in size, but seldom exceed an eighth of an inch in diameter. There may be but one, or several may be irregularly scattered over the surface of the mucous membrane. The whitish circular center is surrounded by a red areola of inflammation, and there is considerable pain and tenderness. In the fauces the distribution is generally confined to the soft palate, but it may also occur on the neighboring mucous membrane of the mouth or larynx.

Faucial herpes is not common, but a person who has once had it is liable to recurrent attacks. The attack is generally preceded by local pain and discomfort in the part affected. The process is an acute one, reaching its height in a few hours,

and disappearing in a few days. It is characteristic of the disease that the pain and discomfort are greater than would be expected from the local lesion.

Diagnosis.—Herpes of the fauces is not infrequently mistaken for some other disease. It differs essentially from syphilis in being an acute process. The character of the eruption, the small circular erosions, with the local tenderness, the red areola, the rapid onset and convalescence, should make mistakes in diagnosis unlikely.

Treatment.—It is a common practice to touch the eroded spots with a solution of nitrate of silver or other coagulent. This may give comfort, but does not influence the time of convalescence which is short. Any application should be so mild and applied in such a way that no healthy epithelium is irritated or destroyed.

MEMBRANOUS PHARYNGITIS

A pseudo-membrane adherent to the mucous membrane of the pharynx demands a careful differential diagnosis. Adherent muco-purulent secretion or crusts may be mistaken for it, but these can be readily wiped away, leaving the normal mucous membrane beneath. An adherent whitish patch may be due to diphtheria, tonsillitis, erosion of the mucous membrane, Vincent's angina or some other infection. Even if the patch is small and constitutional symptoms absent, a culture should at once be taken to determine the presence or absence of the bacillus of diphtheria. In an acute tonsillitis the exudate from the crypts may form a

pseudo-membrane on the surface. Though generally limited to the tonsils, this may also be found on the lymphoid tissue of the pharyngeal wall especially along the lateral fold.

VINCENT'S ANGINA

The essential feature of Vincent's angina is the presence in enormous numbers of the fusiform bacillus and a spirochete on a subacute, pseudo-membranous, and ulcerative lesion. The most typical form is an ulceration of the tonsil, sometimes quite extensive, covered with a foul membranous deposit, but without much surrounding inflammation or constitutional disturbance. The lesion may, however, be very different from this, and may resemble diphtheria, tonsillitis or syphilis. The same or similar micro-organisms are not infrequently found in the mouth and about the teeth, either in connection with different lesions, or without any clinical disturbance. It has not been definitely settled in which cases the spirochete and fusiform bacillus are the cause of the lesion, and in which they play only a secondary part, nor whether they are different stages of the same micro-organism or only accidentally found together. Their presence is best determined by smears, as cultures cannot be depended upon.

Vincent's angina, although it occurs generally in the throat or mouth, has been reported in the larynx, the bronchi and the nose. As a rule, it is not a serious disease, but occasionally a case becomes fulminating, with extensive and rapidly spreading ulceration and necrosis, prostration and

sometimes a fatal termination. It may occur apparently as the first stage of noma. It is contagious, but does not seem to be very actively so.

Treatment.—The ulcers generally heal readily with local applications of antiseptics, such as hydrogen peroxide, nitrate of silver in solutions of from two to eight per cent., tincture of iodine or solutions of chromic acid. Salvarsan intravenously has been recommended in cases which can not be readily controlled by local treatment.

LUDWIG'S ANGINA

This term is sometimes used for a septic invasion of the submaxillary and neighboring regions. It may arise from any cause which allows an infection to reach these parts. The tongue is pushed upward and backward, swallowing is painful and the sublingual space is swollen, hard and tender. As a rule, the process is limited to this region and results in an abscess which comes to the surface in the mouth under the tongue, or more rarely externally. In virulent cases the phlegmon may extend to the lower pharynx and deep structures of the neck, and even become fatal from obstruction or general sepsis.

Treatment consists in external hot applications and surgical opening as soon as it is indicated.

SYPHILIS OF THE PHARYNX

Primary syphilis is sometimes seen on the tonsil. It appears as an indurated tumor with superficial ulceration.

It is distinguished from a neoplasm by its more rapid growth, subsidence and disappearance, by its microscopical structure and by the presence of the *spirochæta pallida*.

Secondary syphilis in the throat is characterized by mucous patches. These patches are roughly bilateral, symmetrical and confluent. Their first appearance is generally on the surface of the tonsils around the crypts. They then appear on the anterior pillar and the soft palate. The symmetrical arrangement of the eruption on the palate, pillars, and uvula is sometimes known as the butterfly pattern. Mucous patches vary in appearance from a slight opalescence to a dirty white membranous inflamed surface, the latter being due to secondary septic inflammation.

Late syphilis appears in different forms. The most typical is a gumma of the soft palate which becomes swollen and red, and soon begins to break down in its center. The central necrosis reaches first the upper and then the oral surface of the palate, forming a round perforation through the body of the palate which steadily increases in size, unless stopped by treatment. If the perforation reaches the free edge of the palate the latter becomes divided into two unequal parts, with the uvula dependent from the larger. A similar destruction may involve the posterior pillar and the pharyngeal wall. After the giving of salvarsan or iodide of potash the extension stops, and the parts not already destroyed heal and are drawn together with cicatricial tissue. A perforation closes leaving a stellate cicatrix. If the pharyngeal walls are involved the posterior pillars are drawn

by cicatricial contraction toward the median line, narrowing and sometimes occluding the passage into the nasopharynx. Late syphilis may appear as a comparatively shallow ulcer of the posterior or nasopharyngeal wall, with elevated infiltrated edges. It does not extend backward into the bodies of the vertebræ. After healing, a cicatricial scar is left. If the gumma is far enough forward on the palate, the hard palate may be involved with necrosis of bone and permanent perforation.

TUBERCULOSIS OF THE PHARYNX

Tuberculosis of the mucous membrane of the pharynx is uncommon, differing in this respect from syphilis, whereas in the larynx this is reversed. In diagnosis, therefore, a doubtful lesion is more likely to be syphilitic in the pharynx and tubercular in the larynx. Local tuberculosis in the pharynx exclusive of lupus, although perhaps it may be primary, is far more frequently seen in connection with pulmonary tuberculosis. Superficial infiltration and ulceration, irregular in shape, often of a worm-eaten appearance, occurs in patches on the posterior or lateral pharyngeal wall, sometimes on the faucial pillars. Occasionally tubercular ulceration is seen on the surface of the tonsil or found within the crypts. Clinically it is in typical cases easily distinguished from lupus, which is much slower, milder, and tends to cicatrize, but in occasional cases the two forms run into each other.

Treatment is similar to treatment of tuberculosis of the

larynx, except, that as the pharyngeal lesion is more easily reached, direct applications are easier to apply. Solutions of lactic acid and formalin may be applied to actually ulcerating surfaces, watching the result to see that they do not irritate. In case there is no pulmonary nor laryngeal tuberculosis also present, more vigorous cauterization or surgical removal would be justified.

Lupus of the pharynx may also be either primary, or more commonly secondary to lupus of the face and nose. It is bilateral, generally invading the faucial pillars and soft palate. It is very superficial and painless and of slow extension. Nodules of active disease and superficial cicatrices are commonly found together. The destruction of tissue and cicatrization may ultimately lead to deformity of the parts, but this is less extensive than the deformity resulting from syphilitic ulceration.

RETROPHARYNGEAL ABSCESS

A retropharyngeal abscess is a collection of pus between the vertebral column and the constrictor muscle of the pharynx. It is at first to one side of the median line but as it increases in size it may involve the whole posterior wall and extend from the nasopharynx to the level of the cricoid cartilage. The back wall of the pharynx may be pushed forward until it is in contact with the relaxed palate.

Etiology.—Retropharyngeal abscess is generally the result of suppuration of a retropharyngeal gland. It may be caused by infection through a wound of the pharyngeal

wall, with consequent pus formation behind the fascia of the constrictor. It is sometimes seen as a complication of caries of the cervical vertebræ.

Symptoms.—Most cases of retropharyngeal abscess occur in infancy. The child begins to have trouble in swallowing, which may soon increase to total inability to swallow anything. At first there is no difficulty in breathing, then there is posterior nasal obstruction, and finally noisy respiration and rarely dyspnea. The child holds its head thrown back and jaw forward in order to carry the anterior wall of the respiratory passages as far as possible away from the bulging posterior wall. The diagnosis is not difficult if the disease be suspected. The bulging pharyngeal wall will be seen, and the fluctuation felt with the finger.

An appearance similar to retropharyngeal abscess of limited size is sometimes seen as the result of enlarged retropharyngeal lymphatic glands, usually unilateral. These glands, if they have not broken down, can be distinguished from an abscess by palpation.

A chronic abscess is generally tubercular. If it is connected with caries of the vertebra, or with a process not limited to the retropharyngeal space it is often inadvisable to open it into the pharynx, but if necessary it may be reached by an external incision through the neck.

An acute abscess must be opened by a free incision. The child may be held upright or placed on its back with the head extended over the end of the table. The tongue is depressed with a tongue depressor and the abscess opened

by a perpendicular incision in the most prominent fluctuating point. It is important that the jaws should be allowed to close after the abscess is opened and that the child should not be made cyanotic by examination before the incision is made. If the child is in the upright position it should be inverted as soon as the abscess is opened. With these precautions the operation is a safe one. The pus, of which there is often a large amount, will either escape through the nose and mouth or be swallowed. If the child cannot close its mouth and consequently cannot swallow, or if it is cyanotic, it may inhale the pus with serious or even fatal results.

In adults the opening of the abscess, which is seldom large, is generally a simple matter.

The patient should be seen daily until he is well, and the incision kept open as long as necessary.

TUMORS OF THE PHARYNX

Papilloma.—A small pedunculated papilloma is sometimes attached to the margin of the palate, especially to the side of the uvula. It is easily removed with scissors.

A papillomatous thickening of the mucous membrane may occur in any part of the pharynx especially on the lateral walls and base of the tongue. It appears white and shaggy, and extends over the surface. It is the precursor of malignant infiltration at its base, and when seen it is often too late to prevent malignant extension to the cervical glands. If discovered in time it should be excised.

Angioma.—Small angiomas may occur on the palate. Deep cavernous angioma may involve the palate, buccal mucous membrane and lateral wall of the pharynx. The mucous membrane is swollen and of a blue shade, due to the dilated veins which it contains. The process may very slowly extend until large areas are involved.

Fibroma.—This is rare, and has no typical form in the pharynx exclusive of the fibroma of the basilar process which is described elsewhere.

Cysts of the mucous membrane are sometimes seen, especially on the uvula and palate.

Lipoma.—A few cases have been reported of a round, smooth, more or less pedunculated lipoma attached to the margin of the larynx or the deep pharynx.

The appearance of a tumor may be caused by an enlarged lingual tonsil, retropharyngeal abscess, a prominent vertebra or a gumma.

Accessory Thyroid Gland.—There sometimes develops at the base of the tongue, from the upper portion of the obliterated embryological thyroglossal duct, a supernumerary thyroid gland, forming a round, smooth, more or less pedunculated tumor. This may become so large that it causes obstruction. For its removal an anesthetic is necessary. The tongue is pulled out as far as possible, a hook or suture put far back on the dorsum, and the base of the tongue with the tumor thus drawn forward. The growth is then removed with a wire ecraseur or by dissection. Before removing the tumor it should be ascertained that there

is a normal thyroid gland. If this is doubtful, part of the accessory thyroid should be left, to guard against myxedema.

Sarcoma of the pharynx occurs in the region of the tonsils, sometimes in other parts of the pharynx. It generally breaks down in the center, forming a slough and later a deep ulcer with more or less indurated edges. It resembles a gumma, from which it is distinguished by its induration, the negative signs of syphilis and its microscopic structure. The question of operation is the same as for malignant new growths in general.

Carcinoma occurs on the palate, lateral wall and deeper parts of the pharynx. It is hard and painful and soon presents a superficial, granular ulceration. The process may be limited at first, but later extends in all directions. It may involve the glands of the neck early in the disease. Unless limited to the palate, the hope of a radical cure by operation is in most cases slight.

CHAPTER XII

ACUTE CONSTITUTIONAL DISEASES

DIPHTHERIA

DIPHTHERIA is an acute infectious disease caused by *Bacillus diphtheriæ* (Klebs-Löffler bacillus). The first local appearance of the disease is generally on the mucous membrane of the pharynx, less frequently of the larynx or nares, rarely on other mucous membrane or the surface of wounds. Beginning as a local hyperemia, there soon appears on the surface of the mucous membrane a superficial adherent exudation or one or more patches of whitish false membrane, which tends to spread hour by hour, but with varying rapidity, to adjacent parts of the mucous membrane. The tonsils, and the lateral pharyngeal walls are common regions for the first appearance of the membrane, although it may occur at any point, especially where the mucous membrane is locally weak. In a severe case the diphtheritic membrane may extend over a large part of the upper respiratory tract.

With the beginning of the local disease, constitutional disturbance also begins, as shown by rise of temperature, weakness of pulse and other symptoms of systemic poisoning. This is due to the toxin developed by the bacilli in their growth. Sometimes there is more, sometimes less, constitutional disturbance than the extent of the local disease

Ans. S } usually constitutional disturbance
note } is out of proportion to extent of local disease.

ACUTE CONSTITUTIONAL DISEASES

229

would lead one to expect, but in general the two increase, stop, and decrease, together.

There is no other constitutional infectious disease which is so well understood, and so scientifically controlled as this one. Its etiology, pathology and treatment may be briefly summarized as follows: The bacillus of diphtheria is carried by contagion onto the mucous membrane of a susceptible person. The bacilli begin to grow in the upper layers of the mucous membrane, forming the characteristic false membrane on the surface while beneath it they force into the blood or lymph stream their characteristic toxin, a strong systemic poison. This bacterial activity tends to spread, and would do so to a certain fatal issue if it were not for the remarkable power of the living body to respond to this biochemical attack by producing and throwing into the circulation a chemical antidote to this toxin, in the presence of which the growth of the colony of bacilli is inhibited and ultimately stopped. In other words, if a person is attacked by diphtheria, a race starts between the invading and the protecting forces, the body trying to neutralize the poison and stop the spread of the local disease before irreparable damage has been done. When there is in the chemical constituents of the blood enough of this antitoxin to neutralize the toxin of the disease and prevent the growth of colonies of bacilli that person is said to be immune to diphtheria. }

As a result of the epoch-making work of Roux and Yersin we are now able to anticipate the time when enough antitoxin shall have been made by the patient to neutralize the

toxin of the disease, by making a horse produce the anti-toxin beforehand, and by holding it ready to inject into the circulation with the first appearance of the disease, producing approximately that same immunity which another person would have who had just recovered from an attack of diphtheria.

Diagnosis.—The importance of early treatment makes an early diagnosis imperative, consequently a culture should be taken from any doubtful case, and treatment should be begun in any case which is clinically positive without waiting for a culture. Any adherent membrane is suspicious.

Complications.—The principal complications in diphtheria are obstruction to breathing from membrane in the larynx and paralysis from the toxin. The larynx, especially in children, is so narrow that a false membrane may easily obstruct it. It is to be remembered that acute laryngeal obstruction in children must always be looked upon as very possibly diphtheria even in the absence of any membrane in the pharynx. The treatment for dyspnea due to diphtheria is intubation, which should be done as soon as the child is seriously distressed for air. In a few cases the intubation tube may not reach the obstruction and tracheotomy may be necessary.

Paralysis from diphtheria is in most cases not severe, nor permanent. It may, however, be both. The more characteristic paralysis is of the soft palate, as a result of which the patient has the peculiar voice heard in cases of cleft palate, when the palatal sounds of K and hard G are lost.

Fluids in swallowing may regurgitate into the nose. The constrictors of the pharynx may be affected, causing difficulty in swallowing. Other parts of the body are sometimes partially paralyzed for a varying length of time. The heart may be weakened, even to the extent of causing sudden death during convalescence. It is therefore necessary to watch the pulse carefully and to keep the patient flat in bed if there is any indication of weakness.

Treatment.—The injection of diphtheria antitoxin is imperative and this should be done as early in the disease as possible. If the local and general symptoms are slight and the diagnosis in doubt, it may be justifiable to wait for a bacterial test. The bacilli can sometimes be recognized from a smear, but this cannot be relied upon, and a culture should always be taken. A negative culture does not always rule out the possibility of the disease, and the patient must be kept under observation. If, in a doubtful case, the local or general symptoms are considerable, or if the case is clinically diphtheria, antitoxin should be given at once. An initial dose of from 2000 to 8000 units, according to the severity of the case should be injected under the skin of the back. At the end of twelve hours if the membrane shows no sign of shrinking and especially if it is spreading, another dose should be given, and this should be repeated if necessary.

The patient should be kept in bed, and the heart and general strength watched. In case of doubt it is better to be slow in allowing him to sit up and move about.

Local treatment in the throat is seldom necessary or advisable.

The danger from antitoxin is slight. There is often urticaria or erythema a few days after the injection, sometimes pains, fever, rapid pulse and general discomfort, but these are unimportant as compared with the value of the antitoxin. In very rare cases, not more than one in several thousand, there is collapse and death following soon after the antitoxin, probably from anaphylactic shock. It seems well established that persons who suffer from that form of vasomotor rhinitis commonly called horse asthma are especially liable to reaction after injection of any preparation of horse serum. In such cases the administration of antitoxin should be carefully guarded and given only when necessary to combat positive diphtheria. A minute dose should first be injected in these cases.

Antitoxin in doses of 500 units may be given as a prophylactic in cases that have been exposed to diphtheria, especially if a culture from the throat or nose is positive or doubtful.

After the membrane has disappeared and the patient is practically well, cultures from the throat and especially from the tonsils may continue to show diphtheria bacilli for days or weeks. Various methods have been advocated for getting rid of these persistent bacilli, but none with definite success. It is necessary to keep such cases isolated, although the virulence of the micro-organism steadily diminishes.

SCARLET FEVER

The throat is always affected to a greater or less extent in scarlet fever. The typical symptoms are an intense punctate redness of the mucous membrane of the pharynx and soft palate, and the so-called *strawberry tongue*, appearing before the eruption on the skin. The tonsils often show exudate in the crypts as in acute tonsillitis. As the disease progresses these spots may run together, forming a pseudo-membrane on the tonsils or even on the pharyngeal wall. The membranous form of scarlet fever can be distinguished with certainty from a complicating infection of diphtheria only by culture, which should show streptococci and no Klebs-Löffler bacilli. In more virulent cases there is actual necrosis of tissue and serious general sepsis.

MEASLES

In measles there is, as a rule, an acute rhinitis and conjunctivitis beginning before the skin eruption and increasing after the eruption has appeared, with laryngitis and bronchitis. Although in most cases these pass off in a few days, in others they lead the way to more serious infections. On the mucous membrane of the fauces an eruption precedes the outbreak on the skin, and the characteristic *Koplik's spots* appear in the mouth. These are small, irregular red spots on the inside of the lips and cheek. In the center of each spot is a small bluish-white speck. These do not coalesce. Later the back-ground becomes a diffuse red with a varying number of bluish-white specks over it. They fade soon after the appearance of the skin eruption.

CHICKEN POX

In varicella a few or several vesicles may appear on the soft palate or neighboring parts. These by maceration become erosions similar to the outbreak of herpes, from which it is distinguished by the simultaneous skin eruption.

GLANDERS

Glanders is an infection with *Bacillus mallei*. The disease is generally confined to horses, but occasionally a man in handling horses becomes infected. It generally begins in the nose, sometimes in the mouth or through an abrasion of the skin. Nodules appear on the mucous membrane which break down into ulcers with indurated edges and a dirty, purulent, foul-smelling discharge. The ulceration destroys all tissue, and may invade neighboring regions. In most cases the disease is acute. The nose and face become reddened and swollen, the glands of the neck become enlarged, there is a pustular eruption of the skin and other symptoms of general sepsis, generally progressive and fatal. The disease is sometimes chronic. The bacilli may lie dormant for months or years and finally become active. Local infiltrations and ulcerations may appear, resembling late syphilis from which they are distinguished by a negative Wassermann reaction, failure to respond to iodide of potash, and the presence of the bacillus mallei. Little can be expected from local treatment.

CHAPTER XIII

CHRONIC INFILTRATING AND ULCERATING DISEASES

IN CERTAIN chronic diseases the mucous membrane of the upper respiratory tract becomes infiltrated and often ulcerated. Of these diseases syphilis, tuberculosis, and cancer are common. In this part of the world leprosy and rhinoscleroma are rare, but the possibility of their appearance must be borne in mind in cases of doubtful diagnosis. The differential diagnosis between syphilis, tuberculosis, and malignant disease in typical cases is easy, but in doubtful cases or where two or more are combined it may be difficult. Neither is it always easy to rule out simple acute swelling and chronic inflammatory thickening.

The early lesions of syphilis are generally superficial and constitutional. The late lesions are typified by gummatous infiltration and ulceration.

Tuberculosis may clinically be divided into lupus and the more malignant form of tuberculosis.

Malignant disease includes different forms of carcinoma and sarcoma.

In doubtful cases the possibility of more than one disease must be borne in mind. The differential diagnosis between the groups of syphilitic, tubercular, and malignant lesions is

Differential diagnosis.	Late syphilis.	Tuberculosis.		Malignant neoplasms.
			Lupus.	
Special diagnostic point.	Wasserman, effects of Ki.	T. B. in sputum, T. B. in lesion. Reaction to tuberculin.	Microscopic structure.
More common localities.	Palate, fauces, mouth nasal cavity.	Larynx.	Anterior nares, upper incisor gums, pillars and palate, epiglottis.	Tonsil, tongue, accessory sinuses.
Other lesions often present.	Old scars.	Pulmonary.	Skin of face.	
Infiltration	Soft, red, diffuse.	Irregular, pale.	Superficial, small nodules.	Hard, localized.
Ulceration	Deep, punched-out, even edges.	Not deep, irregular, "worm eaten."	Very superficial. Activity and cicatrices in the same field. Multiple.	Carcinoma superficial, red; sarcoma deep, sloughing.
Pain	Little.	Varying.	None.	Common.
Age	Generally young.	Elderly.
Time	Weeks.	Months.	Years.	Months.

much aided by the Wassermann reaction, the presence of spirochetæ, the therapeutic test of iodide of potash upon gummata, the presence of the tubercle bacillus or the reaction to tuberculin in tuberculosis, and the microscopical structure of malignant growths. Other differences between these diseases are here put into tabular form.

SYPHILIS

Syphilis is commonly divided into primary, secondary and late stages.

The primary stage, the chancre, is the lesion at the place of infection. It is a tumor exhibiting characteristic induration, sometimes a superficial ulceration, and is accompanied by indurated swelling of the lymph glands, at first near the lesion, later in other parts of the body. The primary lesion is rare in the nose or throat. It may occur in or near the nasal vestibule, on a tonsil, the lip, or the tongue. It appears from two to four weeks after infection and lasts a few weeks, to be followed by the secondary symptoms. It may be mistaken for a neoplasm. The diagnosis should be made by the acute history, the induration, the finding of the *Spirocheta pallida* and, finally, by the appearance of secondary lesions.

The secondary stage is characterized on the mucous membrane by superficial plaques, called mucous patches, appearing generally at the same time as the macular skin eruption, or headache, loss of hair and other secondary symptoms. The mucous patch is never deeply infiltrating, nor does it

cause a true ulcer. There is a superficial opalescence of the epithelium, in areas of different size and shape. Typical mucous patches may cause a feeling of irritation, but seldom actual pain; they may, however, become infected with the micro-organisms commonly found in the mouth, and show all the symptoms of a superficial septic abrasion, pain, tenderness, an inflamed base, and a pseudo-membranous surface which may become foul. The *spirocheta pallida* can be found in the mucous patch, and the greatest care must always be taken to guard against infecting other persons. Mucous patches tend to appear in certain locations, especially on or near the tonsils, the faucial pillars and the soft palate. If areas of mucous membrane are abraded, as sometimes in the buccal mucous membrane opposite defective teeth, or on the lips and corners of the mouth, the mucous patches may appear there also. They are not rare on the epiglottis and in the larynx; they are less common in the nose. The duration of mucous patches varies with the severity of the disease and with the effects of treatment, being generally a few weeks. They may be to a certain extent recurrent, appearing after the secondary outburst has subsided. As the disease progresses they become less typical, and may merge into later lesions. Preceding and accompanying mucous patches in the secondary eruption is often an erythema of the mucous membrane.

Late syphilis may appear at any time after the secondary symptoms have subsided, or even before. Some of the lesions are characteristic, others difficult of diagnosis. The

typical late lesion, the gumma, shows chronic infiltration with a tendency to ulcerate. If cartilage is attacked it soon breaks down. If bone is attacked it necroses, the necrosed portion ultimately separating as a sequestrum.

Late syphilis may also cause condylomata and localized thickening of the mucous membrane, cartilage or bone.

Diagnosis.—The diagnosis of syphilis is sometimes easy, sometimes difficult, but that it should be correct is always of vital importance to the patient. If a patient is told that he has the disease when he has not, it may lead to unnecessary treatment and restraint. If the disease is not discovered it may lead to worse or even fatal results. Syphilis may resemble several diseases, which also means that several diseases may resemble syphilis. Too much importance is often attached to the patient's past history. A lack of knowledge on his part of previous trouble should not overcome positive or even suspicious evidence, neither should a positive assertion that he has syphilis be accepted without careful consideration of the points on which the assertion is based. To delve into the history of a case requires tact, the lack of which may injure the patient or the physician or both. Unmistakable syphilitic lesions sometimes appear in persons in whom the history would apparently absolutely exclude the disease, and a physician not infrequently is led astray by a patient's history who would have made a correct diagnosis if he had disregarded it.

If a certain diagnosis can be made of a chancre, treatment may be begun at once. A mucous patch can seldom by its

appearance alone prove the disease. If, however, the distribution is characteristic, the probability is strong. Generally there will be present at the same time other lesions, which will make the diagnosis certain.

Late lesions may be difficult to prove. The typical gumma responds to iodide of potash in a week or two, but in order to be sure that it would not have disappeared of itself equally rapidly a doubtful case may be watched for a few days before giving the iodide. The differential diagnosis between late syphilis, tuberculosis and cancer is shown in the previous table. The evidence of cicatrices showing destruction of tissue in the past is sometimes valuable, if their position and history coincide with probable gummatous ulceration.

The **Wassermann test** is of the first importance in determining whether the patient has syphilis. The technique requires a special equipment, but should always be used if possible. A positive finding does not always prove that the lesion under investigation is due to syphilis and a negative finding does not rule out the disease. The Wassermann reaction may be negative temporarily and later become positive. If the patient with syphilis is taking mercury or alcohol in excess the reaction may be negative in consequence.

The finding of the *Spirocheta pallida* in the primary lesion and the mucous patch is evidence of the existence of the disease. But it must be remembered that different forms of spirochetæ are commonly found in the mouth around the

teeth and in other lesions of the pharynx, and that these may easily be mistaken for the spirocheta pallida.

Treatment.—The important treatment for syphilis in all stages is constitutional. This should be undertaken seriously, both by the physician and the patient.

The quickest and most thorough method of attacking the infecting organism and clearing up the lesions is with salvarsan, which may be given for any syphilitic lesion and at any stage. Special knowledge of the use of this drug is required for its safe administration. Whether in addition to salvarsan other drugs should be given, or whether other drugs are to be preferred to it must be determined by the condition of the patient and the judgment of the physician. Frequent or speedy relapses indicate the use of additional weapons.

The older antisyphilitic drugs are mercury and iodide of potash. Their action and indication for use are not the same. Mercury poisons the organism and destroys it or checks its activity. Iodide of potash neutralizes its products in the late stages. If the secondary outbreak is not controlled by salvarsan, mercury is indicated.

Better results are obtained by giving it to the point of toleration, then omitting it, and giving it again than by a prolonged course in smaller doses. The stomach is not the best way of introducing it, if it is possible to give it by inunction or subcutaneously.

Iodide of potash will generally stop at once all extension

of gummatous lesions, and allow them to heal. It is never in itself a sufficient treatment of syphilis.

After any course of treatment the patient should be kept under observation, for months or years, the Wassermann test applied periodically and treatment resumed when it is indicated.

Local Treatment.—The typical mucous patch seldom requires local treatment, except that a non-irritating cleansing mouth wash or gargle is always advisable. If, however, the mucous patch has become infected, as is shown by tenderness, exudate and inflamed surrounding mucous membrane, it should be treated as a superficial septic abrasion, by local cleansing and antiseptic wash. It must always be remembered that irritation is liable to damage underlying healthy tissue, and applications and the strength of washes should be regulated accordingly. In mild cases solutions of boric acid, borax or Dobell's solution will be sufficient. In more severe cases, especially in those which are later than the secondary outbreak, a weak solution of nitrate of silver or a solution of trioxide of chromium may be carefully applied to the mucous patch, and peroxide of hydrogen occasionally added to the mouth wash or spray.

Locally it is seldom necessary to make any applications to a syphilitic ulcer, except to give a cleansing wash. If, however, the ulcer does not heal readily under internal treatment, its surface may be cleaned and a solution of trioxide of chromium applied to it. This should be strong enough to leave a yellow stain, but not to destroy healthy

tissue; a solution of from twenty to fifty per cent. carefully applied will stimulate activity and act as a local antiseptic. The same treatment may be useful in chronic syphilitic chondylomata.

TUBERCULOSIS

Clinically tuberculosis of the upper respiratory tract is to be considered distinct from lupus, although the two sometimes run into each other. Local tuberculosis as distinguished from lupus may occur secondarily to pulmonary tuberculosis, in which case it is generally in the larynx, much less frequently in the pharyngeal wall. Tubercle bacilli, possibly of the bovine variety, are not infrequently found in the tonsillar ring, and sometimes cause a local infiltration and enlarged cervical glands, especially in children. Local tubercular infiltration occasionally occurs in the nose or mouth, possibly as a primary infection, although more often as part of a more general disease.

The diagnosis is made by the finding of the tubercle bacillus, the typical giant-cell, the tuberculin test and the exclusion of other disease as already described.

The treatment should always be constitutional and in certain cases local. Constitutional treatment is, with few exceptions, more important than local. It consists in attention to fresh air, rest and food as in general tuberculosis. Local treatment in order to be effective must generally be surgical. It is well to remove tubercular tissue or foci when it can be done without too much trauma or irritation, as in tubercular tumors, projections, tonsils, or

glands. Solutions of lactic acid, fifty per cent., or formalin, two per cent. may be rubbed into an ulceration, but this should be abandoned if the benefit is not apparent. As a rule irritating applications are harmful and bland ones are ineffective. Infiltrated but not ulcerated mucous membrane should never be roughly handled, except when it is hoped that the disease may be entirely removed locally to sound tissue beneath by a curette, solid nitrate of silver, or the galvanocautery.

LUPUS

Lupus may be secondary to lupus of the skin, or primary in the nose, mouth or throat. The parts most commonly affected are the anterior nares, the gums about the upper incisor teeth, the faucial pillars, the velum palati and the epiglottis. A typical case differs much from the more malignant type of local tuberculosis. The surface appears granular, with shallow ulceration and cicatrization at the same time in the same field. The process is generally very slow and free from pain. Any discomfort is due to the mechanical deformities of the parts involved. Most cases show no other signs of tuberculosis, and it is probable that the bacillus differs in some way from the more malignant tubercle bacillus. It occasionally occurs in more than one member of a family, suggesting a possible infection.

The diagnosis is often aided by the presence of a typical lupus of the skin of the face. It can generally be recognized by its slow history, lack of pain, simultaneous activity

and cicatrization, failure to respond to iodide of potash and its location.

The prognosis is not good for the entire cessation of activity, but the extension of the destruction of tissue may be very slow.

Treatment.—The treatment of lupus within the nasal and pharyngeal cavities is discouraging as compared with its treatment on the skin, on account of its inaccessibility. The physician should always assure himself that he is not doing more harm by local irritation than good by partial removal of the disease. If diseased tissue can be removed to a healthy margin without sacrificing healthy structures it is the most hopeful method of treatment and it is generally advisable. If it is hoped to remove all of the disease, it may be excised, but in most cases a curette is the best method of removing as much of the disease as possible with least injury to surrounding healthy tissues. To be effective recurrences should be curetted as soon as possible. When the disease is so situated that it can not be surgically removed, the applications of solutions of formalin one or two per cent. and lactic acid forty to 100 per cent., have been recommended. Their value is, however, doubtful. Tuberculin is sometimes carefully given. The so-called two-way method of treatment consists in giving iodide of potash internally and a reducing agent such as peroxide of hydrogen locally in order to liberate free iodine when the two come together on ulcerating surfaces. Methods used for treatment of lupus of the skin are sometimes

tried, such as solid nitrate of silver, freezing, x-ray, and Finsen light; but are seldom applicable within these cavities. All irritation which is not evidently doing good should be avoided.

LEPROSY

In many localities leprosy is so seldom seen that a physician in examining the nose and throat may fail to recognize it because he does not happen to think of it as a possible diagnosis. It should be suspected if areas of chronic infiltration are found in the mucous membrane which can not be accounted for by syphilis or tuberculosis. Leprosy has been said to travel from nose to nose, meaning that the nose is the part first affected, and the nasal secretions the medium of contagion. Although this has been disputed there is probably an element of truth in it. An early lesion is sometimes a small subepithelial collection of yellow purulent material full of the lepra bacillus, on the cartilaginous septum. These increase in number and size and finally rupture forming dry hard crusts on an ulcerating surface which bleeds easily. The common lesions are infiltrations in the mucous membrane of the septum, turbinates, palate, epiglottis or other parts of the nose and throat; very chronic, firm, nodular, sometimes ulcerating on the surface and with a tendency to slow destruction of tissue and cicatricial contraction. They are often anesthetic so that the patient suffers no local pain, although there may be much discomfort from mechanical obstruction.

The disease is very slow and may not be discovered for years. In advanced cases the skin is always affected. The diagnosis can generally be made by finding the lepra bacillus in the nasal lesions or secretion.

SCLEROMA

Scleroma occurs mostly in southeastern Europe, the Balkans, Poland and Hungary, but a few cases have been reported in America among immigrants from these countries.

The disease is probably caused by a specific organism. A bacillus often found in the tumor closely resembles Friedlander's bacillus, but it is impossible to believe that the common Friedlander bacillus can be the cause of the disease.

The infiltration of the mucous membrane is generally circumscribed, though sometimes diffuse. It is very hard, painless and does not ulcerate. It is at first red, but later pale and sometimes cicatricial. It is very slow in growth, sometimes nearly stationary, often increasing slowly for many years. It grows into tumors of considerable size which ultimately obstruct the air passages or deform the external nose and face.

It generally, though not always, begins in the nose, and is therefore often called Rhinoscleroma. The first symptoms are nasal discharge becoming foul, scabs, and an appearance similar to atrophic rhinitis. Later there develop hard tumor-like masses, obstructing the nose or nasopharynx. In the pharynx the characteristic hard, thick

circumscribed, infiltrated areas are seen on the lateral wall or palate. In the larynx or trachea the growth may obstruct respiration.

The differential diagnosis between scleroma and syphilis, cancer or leprosy is made by the induration, absence of ulceration, very long history, painlessness and the microscopical structure showing peculiar large cells, hyaline degeneration and pure cultures of the bacillus previously described.

The prognosis is bad. The disease is progressive although slow.

Treatment is generally regarded as hopeless. Obstructions to respiration should be removed, and if necessary the larynx or trachea periodically dilated. Good results have been reported from *x*-ray and radium.

The disease is undoubtedly contagious, although not actively so. In this respect, and in the necessity for isolation it probably resembles leprosy.

ACTINOMYCOSIS

This is a rare disease caused by the actinomyces or *ray fungus* which penetrates the mucous membrane, forming hard nodular swellings which ultimately break down into chronic abscesses. The contents are a thin purulent fluid, containing small, hard, gritty, yellow particles. The abscesses may open and continue to discharge through a fistula. The floor of the mouth is most frequently affected, but it is sometimes found in neighboring regions.

The disease may resemble the infiltration of tuberculosis or a gumma. The diagnosis is made by finding the ray fungus under the microscope. Treatment consists in giving iodide of potash internally, which has a specific action on the fungus, and in curetting the abscess locally.

CHAPTER XIV

ANATOMY AND PHYSIOLOGY OF THE LARYNX

THE larynx is a cartilaginous box placed on the top of the trachea. Its primary function is to act as a valve to prevent food and other foreign substances from getting into the air channels and lungs. Secondly it has developed into an organ of sound.

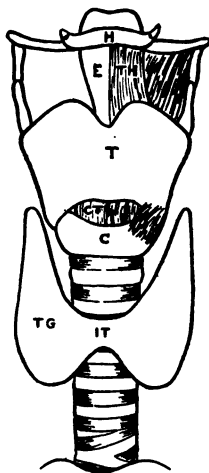


FIG. 47.—Anterior aspect of the larynx and trachea. H, Hyoid bone; E, Epiglottis; TH, Thyrohyoid membrane; T, Thyroid cartilage; C, Cricoid cartilage; CT, Cricothyroid membrane and muscle; TG, Thyroid gland; IT, Isthmus of thyroid.

THE CARTILAGES

There are five principal cartilages.

The **thyroid cartilage** presents two wings joined at an

angle anteriorly. The posterior borders project upward forming the superior cornua for the insertion of the thyrohyoid ligament, and downward forming the inferior cornua which articulate with the cricoid cartilage.

The **cricoid cartilage**, so called because it is shaped like a seal ring, is narrow in front and broad behind. To its

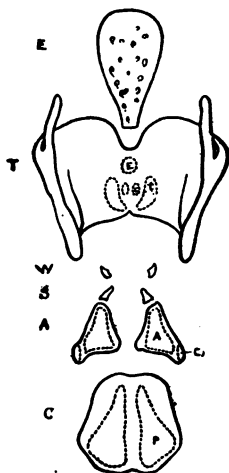


FIG. 48.—The cartilages of the larynx. E, Epiglottis; T, Thyroid; W, Cartilages of Wrisberg; S, Cartilages of Santorini; A, Arytenoids; C, Cricoid.

Insertions. c, Vocal cords, t, thyroarytenoid muscles; a, arytenoideus; ca, lateral and posterior cricoarytenoid muscles; p, origin of the posterior cricoarytenoid muscles.

lower margin the trachea is attached. Upon the upper surface of the broad posterior portion are placed the arytenoid cartilages. Anteriorly the space between it and the thyroid cartilage is closed by the cricothyroid membrane.

The two **arytenoid cartilages** are roughly three-sided

pyramids with their bases resting upon and articulating with the cricoid. At the apex is attached the aryepiglottic fold within which and just above the arytenoids are the small *sesamoid cartilages of Santorini and Wrisberg*. At the anterior angles or vocal processes the vocal cords are attached. By their motion the glottis opens and shuts,

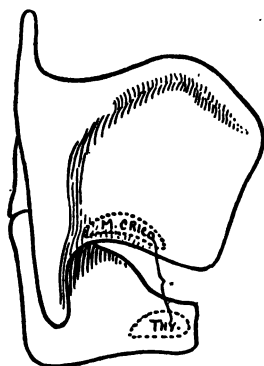


FIG. 49.—Lateral view of the thyroid, cricoid and one arytenoid cartilage, and the origin and insertion of the cricothyroid muscle.

and sound production is regulated. The space between the two arytenoid cartilages is closed by the interarytenoid fold and the arytenoideus muscle.

The **epiglottis** is a leaf-shaped cartilage attached by its smaller end to the inner surface of the anterior angle of the thyroid cartilage. It projects upward and somewhat backward, acting as a shield to protect the cavity of the larynx from substances flowing over the base of the tongue. The lateral margins of the epiglottis are joined with the apex of the arytenoids by the aryepiglottic folds.

THE CAVITY OF THE LARYNX

The upper margin of the laryngeal cavity is made by the rim of the epiglottis, the two aryepiglottic and the interarytenoid folds.

The **ventricular bands**, or *false vocal cords* are stretched from the anterior surface of the arytenoids to the angle of the

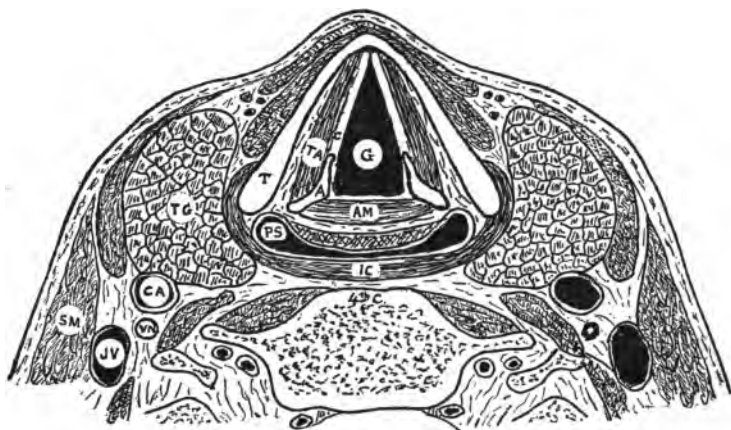


FIG. 50.—Cross section of the neck at the level of the vocal cords. G, Glottis; C, Vocal cord; T, Thyroid cartilage; A, Arytenoid cartilage; TA, Thyroarytenoid muscle; AM, Arytenoid muscle; IC, Inferior constrictor muscle; PS, Pyriform sinus; TG, Thyroid gland; CA, Common carotid artery; VN, Vagus nerve; JV, Internal jugular vein; SM, Sternocleidomastoid muscle; 4th C, Fourth cervical vertebra.

thyroid cartilage. As seen in the laryngeal mirror they appear just above and external to the true cords, and form part of the lateral walls of the laryngeal cavity.

The **vocal cords** are thick bands of yellow elastic tissue attached in front to the thyroid cartilage, behind to the vocal processes of the arytenoid cartilages. The anterior

attachments are stationary, the posterior are brought together or separated by movements of the arytenoid cartilages. The resulting aperture, a slit when closed, triangular when open, is called the glottis.

The **ventricles of the larynx**, or *ventricles of Morgagni* are pouches opening between the false and true cords, and extending upward behind the former. They contain lymphoid glandular tissue, the secretion from which is commonly supposed to lubricate the vocal cords, regulated by a small collection of muscular fibers, called the *compressor sacculi laryngis*, running between the arytenoid and lower part of the epiglottis on each side.

The **blood supply** of the larynx comes principally through the superior laryngeal, and partly through the cricothyroid arteries, both branches of the superior thyroid. The veins empty into the superior, middle and inferior thyroid veins.

The **mucous membrane** of the upper margin of the larynx and of the vocal cords is covered by squamous epithelium. The rest of the laryngeal cavity is lined with ciliated epithelium, continuous with that of the trachea and bronchi.

THE MUSCLES OF THE LARYNX

The extrinsic muscles of the larynx, or those which unite it with other structures are: the thyrohyoid, the sternothyroid, the inferior constrictor of the pharynx and the stylopharyngeus. They raise and lower the whole larynx and with it the trachea.

The intrinsic muscles of the larynx are those which move

different parts of the larynx itself. The principal ones are the cricothyroids, the posterior cricoarytenoids, the lateral cricoarytenoids, the arytenoideus and the thyroarytenoids.

There are also muscular fibers between the margins of the epiglottis and the arytenoid and thyroid cartilages. These

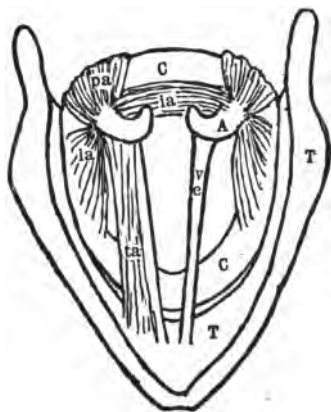


FIG. 51.—Diagram of the larynx, showing the muscles attached to the arytenoid cartilages (after Gray). A, Arytenoid cartilage; C, Cricoid cartilage; T, Thyroid cartilage; ia, Arytenoideus muscle; pa, Posterior cricoarytenoid; la, Lateral cricoarytenoid; ta, Thyroarytenoid; vc, vocal cord.

form part of the sphincter which closes the larynx during swallowing.

The **cricothyroid muscles** bring together the anterior margins of the thyroid and cricoid cartilages, closing the cricothyroid space and stretching the vocal cords. The cords being attached to the anterior angle of the thyroid in front, and through the arytenoids to the cricoid behind, are made tense as the thyroid is pulled forward.

The **posterior cricoarytenoid muscles** by pulling backward the outer angles of the arytenoid cartilages, rotate the vocal processes outward, and open the glottis.

The **lateral cricoarytenoid muscles**, by pulling the outer angles of the arytenoid cartilages forward, rotate the vocal processes inward, and close the glottis, especially the anterior two-thirds.

The **arytenoideus muscle**, by bringing the two arytenoid cartilages together, helps to close the glottis, especially the posterior third.

The **thyroarytenoid muscles** run parallel with the vocal cords. They therefore by contracting may slacken or shorten the cords, but undoubtedly their function is much more complex than this. As in the case of the orbicularis oris which with the aid of neighboring muscles is capable of producing a great variety of facial expression, so the thyroarytenoids with their intimate association with the cords are capable of subtle influences upon voice production, too intricate to follow.

THE NERVES OF THE LARYNX

The nerve supply of the larynx is on each side through the superior laryngeal and inferior laryngeal or recurrent nerve, both branches of the vagus.

The **superior laryngeal nerve** divides into two branches. The external branch supplies motion to the cricothyroid muscle. The internal branch enters the cavity of the larynx through the thyrohyoid membrane and is the nerve of

sensation of that cavity. It also partly supplies the arytenoideous muscle with motion.

The **recurrent laryngeal nerve** is essentially the nerve of motion of the intrinsic laryngeal muscles. It is a disputed

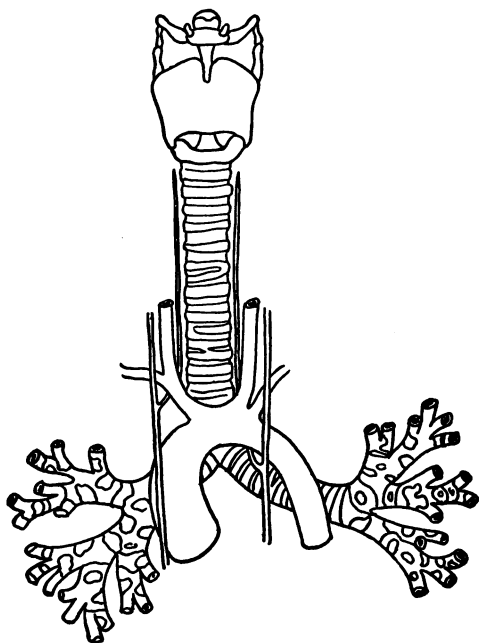


FIG. 52.—Diagram showing relationship of the arch of the aorta and the trachea to the vagus and recurrent laryngeal nerve on the two sides.

question whether it carries any fibers of sensation. Its course on the two sides is different. On the left side the nerve leaves the vagus near the arch of the aorta and curves around it. On the right side it winds around the subclavical artery, making a shorter course than on the left. On each side the

nerve then ascends in the groove between the trachea and the esophagus.

PHYSIOLOGY OF THE LARYNX

The essential, indispensable function of the larynx is to act as a valve to protect the lower respiratory passages. These passages must necessarily stand open, most of the time and as they lead directly out of the digestive tract an accurate apparatus is required to prevent the entrance of foreign bodies into the lungs. This is provided by the sphincter-like closing of the larynx under reflex and voluntary control, and the irritability of the laryngeal mucous membrane exciting to reflex cough. Further protection is offered by the ciliated epithelium of the air passages which raises small foreign bodies and secretion from the bronchi and trachea into the pharynx. The sphincter valve of the larynx is made by the closing of the glottis and the simultaneous contraction of the muscular fibers of the aryepiglottic folds and ventricular bands.

The secondary function of the larynx is the production of sound. In most animals this function is simple, one or a few tones only being produced. In man the larynx has become very highly developed as a sound-producing organ.

Sound is produced in the larynx by the approximation and vibration of the vocal cords. This vibration is caused and maintained by the expulsion or occasionally by the inspiration of air by the respiratory muscles. The approximation of the cords is effected and regulated by the intrinsic muscles

of the larynx. The length and breadth and shape of the resulting chink of the glottis and the rigidity of its margins determine the pitch or tone of the sound which is produced. As these factors in the human larynx are under accurate control, this organ has all the possibilities of a musical instrument. The shorter the glottic chink, and the more tensely stretched the cords the higher will be the note. The length of the chink may be decreased if the posterior portion of the cords are held together by the vocal processes. Difference in tension as well as in length are governed by the thyroarytenoid and cricothyroid muscles.

The singing voice while produced in the larynx is modified in various ways by the muscles of respiration, and by the shape of the resonating cavities above the larynx, the pharynx, the mouth and the nose. But the possibilities of the human singing voice are due to the development of the human larynx. Control of the instrument through the nervous system and musical ability are as necessary for good singing as for the playing of any other musical instrument. Proper control of the breath, and of the upper respiratory passages are necessary, but the integrity of the larynx is essential for clear tone production.

Speech.—The speaking voice as distinguished from the singing voice is only dependent on the larynx for the tone necessary to give it strength. Without this tone there is left the whispering voice. The tone need be no more than a monotone, although there are usually slight variations in the pitch to aid expression. The out-going column of air

receives this tone from the vibrating cords and then in its passage through the mouth and nose it is deflected or otherwise modified by the palate, the tongue, the teeth and the lips, to form letters and words of speech.

CHAPTER XV

DISEASES OF THE LARYNX

THESE may be either acute or chronic. Inflammation is seldom limited to the larynx alone, but is generally a part of a process involving also the mucous membrane of the other regions of the respiratory tract, the nose, pharynx, trachea, and bronchi.

In the larynx the inflammatory process affects the vocal cords to a different degree from the rest of the cavity. They may escape altogether, on the other hand, they may be the only part noticeably inflamed.

ACUTE LARYNGITIS

Etiology.—The susceptibility of the larynx to acute inflammation of the mucous membrane varies with different persons. The most common cause is the extension to the larynx of acute inflammation of the pharynx and nose, as in common “cold” or some other acute infection of the upper respiratory tract. The process may, however, start in the larynx, and either be confined to it, or more frequently spread to the trachea below and often to the pharynx and nose above. Acute laryngitis may also be induced by irritation or trauma, as from acrid fumes or from shouting. It may arise from some constitutional disturbance affecting the mucous membrane.

Symptoms.—The symptoms are a sensation of irritation or dryness in the larynx, generally hoarseness and sometimes cough. The amount of hoarseness depends upon the degree of inflammation of the vocal cords, and varies much in different cases. The cough is due to a tickling sensation and may be paroxysmal. There is seldom any secretion directly due to an acute laryngitis. The amount of secretion which a larynx can produce is small, and it is generally safe to say that any secretion seen in the larynx or raised from it by the patient comes from below. By careful examination of the trachea this can often be proved. On inspection an increased redness of the mucous membrane will be seen, especially marked if the normal whiteness of the cords is changed to red. In rare and severe cases there may be also swelling or edema of the aryepiglottic folds, interarytenoid space, ventricular bands, the cords, or subglottic mucous membrane.

In connection with acute laryngitis it is interesting to note the condition of the trachea as seen in the laryngeal mirror. Normally the tracheal mucous membrane is pale or whitish with the rings distinctly visible through the delicate mucous membrane. But if the mucous membrane is inflamed it becomes bright red and the contour of the rings is lost. In no part of the upper respiratory tract is the inflammatory disturbance caused by an acute infection more definitely seen. In whooping cough this redness of the trachea is especially intense.

Treatment.—In acute laryngitis this should always be

soothing and never irritating. The avoidance of exposure to dust or cold, and rest of the voice, are important. Inhalations made by boiling water to which has been added compound tincture of benzoin is an old and common remedy. Sprays, if used at all, should be of the blandest type.

Internally five to ten drops of wine of ipecac has for many years been a common treatment of laryngitis especially in children. Opium in some form is often given for adults, or in the form of paregoric for children.

CROUP

The word croup originally meant a croaking sound, from this it was used to denote different forms of acute laryngeal obstruction, accompanied by noisy breathing. It was commonly divided into true or membranous and false croup.

True or membranous croup has been found to be practically always laryngeal diphtheria, and many attempts have been made by health authorities to discard the term in order that its true diphtheritic nature should not be overlooked. False croup includes subglottic laryngitis and laryngismus stridulus.

SUBGLOTTIC LARYNGITIS

This special form of acute laryngitis occurs not infrequently in children, rarely in adults, and is liable to recur in the same person. It produces the so-called false croup, a condition in which acute inflammation especially of the subglottic portion of the larynx combined with glottic spasm

causes noisy breathing and spasmodic dyspnea. It is in most cases a local manifestation of the disease generally called a common cold, where the acute inflammation either starts in the larynx or spreads to it from the nose and pharynx. If a view can be had of the larynx, the subglottic mucous membrane, swollen and very red in color can often be seen through the chink of the glottis during inspiration. This



FIG. 53.—Subglottic laryngitis in a child.

swelling of the mucous membrane in this position narrows the lumen of the lower part of the larynx sufficiently to make respiration audible. The obstruction is almost never serious enough to threaten life. The cords themselves are generally inflamed and the whole interior of the larynx sensitive. In addition to the noisy respiration there is added a croaking cough and periodic inspiratory spasm in which the patient appears for a few seconds to be struggling for breath, followed by a prolonged noisy inspiration. The small size of a child's larynx makes it much more susceptible to the combination which produces this so-called false croup than the larger larynx of the adult. Some children become croupy whenever they have a laryngitis. As the child gets older the tendency to attacks disappears, although occasionally it persists into adult life.

An attack may last from a few to several minutes, and is

frequently repeated. The attacks are much more liable to occur at night, sometimes repeating themselves for a few successive nights, while in the intervening days there is simply a little hoarseness with occasional croaking cough. During the paroxysm the child may suffer from distressed breathing especially on inspiration, giving the appearance of imminent dyspnea or asphyxia, the actual danger of which is however, remote. It is often alarming without being dangerous. It must be distinguished from serious laryngeal obstruction, the most frequent cause of which is diphtheritic or membranous laryngitis. In subglottic laryngitis the dyspnea is transitory and periodic. In diphtheria of the larynx the dyspnea is progressive, and the onset insidious.

Treatment.—Steam inhalations, which may contain compound tincture of benzoin is an old and tried remedy. The bowels should be opened with calomel. Wine of ipecac is commonly given in doses of a drop for each two years of the child's age and paregoric in moderate doses. After the attack the child should be examined for enlarged tonsils and adenoids, and these should be removed if present.

Although fatal dyspnea is extremely rare, in some cases it is well to be prepared for intubation, especially when there is any doubt of the diagnosis.

LARYNGISMUS STRIDULUS

This is in many respects similar to the croupy attacks of acute subglottic laryngitis, except that the glottic spasm appears to be the primary symptom, instead of being second-

ary to an acute inflammation, as it is in the latter. It is more common between six months and two years of age, but once established it may persist throughout childhood. It is seen especially in dyspeptic or otherwise feeble children. The attacks occur almost always at night, and recur at irregular intervals either on the same or subsequent nights, often with little or no warning. The child suddenly starts up with a noisy and obstructive breathing, limited to inspiration. The dyspnea may be intense, but is of short duration a few seconds to a minute or two; the respiratory spasm relaxes, often suddenly. The child may be otherwise in apparently good health and show no other symptoms except often a little croupy cough. The prognosis is generally good, although cases are occasionally reported of death from dyspnea or exhaustion. The treatment is the same as that for subglottic laryngitis.

EDEMA OF THE LARYNX

Edema of the aryepiglottic folds, including sometimes the arytenoids and epiglottis is not uncommon. It may produce considerable swelling without causing symptoms. It sometimes, although not very often, becomes extensive enough to obstruct breathing. The ventricular bands, vocal cords, or the subglottic mucous membrane also become edematous, conditions which are fortunately rare, as respiration soon becomes obstructed.

Etiology.—Edema may be caused by an infectious or traumatic inflammation or by some constitutional disease.

An extension of inflammation from the pharynx, as in peritonsillar abscess, may produce edema of the aryepiglottic fold, generally of slight extent. Extensive and serious edema may be caused by local trauma, such as the inhalation of hot flame, or by a local infection of a severe or virulent type, such as erysipelas. In cardiac disease there may be a more chronic edema in the larynx, though rarely extensive enough to obstruct respiration.

Symptoms.—Edema of the glottis does not of itself give rise to pain, but the inflammatory process of which it is a part may be very painful. As the edema increases in extent the patient may become hoarse, feel sensations of stiffness and of a foreign body, dysphagia and finally distressed breathing.

Diagnosis can only be made positive by inspection. Edema of the aryepiglottic fold shows swelling and pallor. If extensive it appears as a globular, whitish tumor, not unlike a nasal polypus in appearance, shutting off a view of the glottis beneath, and sometimes moving with respiration. The ventricular bands, if edematous appear white and swollen so that the true cords beneath can not be seen.

If the subglottic mucous membrane is edematous, the two lateral walls are visible one under each vocal cord, as described in subglottic laryngitis, except that the color is pale instead of being a bright red.

Treatment.—For a mild degree of edema, rest, avoidance of everything irritating, the sucking of ice or an ice-bag to the neck. If the edema is more extensive and especially

ary to an acute inflammation, as it is in the latter. It is more common between six months and two years of age, but once established it may persist throughout childhood. It is seen especially in dyspeptic or otherwise feeble children. The attacks occur almost always at night, and recur at irregular intervals either on the same or subsequent nights, often with little or no warning. The child suddenly starts up with a noisy and obstructive breathing, limited to inspiration. The dyspnea may be intense, but is of short duration a few seconds to a minute or two; the respiratory spasm relaxes, often suddenly. The child may be otherwise in apparently good health and show no other symptoms except often a little croupy cough. The prognosis is generally good, although cases are occasionally reported of death from dyspnea or exhaustion. The treatment is the same as that for subglottic laryngitis.

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Etiology.—Edema may be caused by traumatic inflammation or by some

DISEASE -

An extension of inflammation from the tonsillar abscess to the soft palate and uvula, generally of the acute type, and edema may be caused by the direct action of hot flames or by the inhalation of irritant gases, such as carbon dioxide, or by a more chronic inflammation of the soft palate enough to cause edema.

Symptoms:—~~There is a~~ rise to ~~part~~ of the ~~temperature~~ part may be very ~~part~~ the patient may ~~become~~ and of a ~~loose~~ breathing

Diagnosis can be made by the following signs and symptoms:

1. Hoarseness or loss of voice, which may be permanent or temporary.

2. Pain in the throat, which may be severe and persistent.

3. Swelling of the larynx, which may be visible on examination.

4. Difficulty in swallowing, which may be accompanied by pain.

5. Fever, which may be present in some cases.

6. Cough, which may be dry or productive of mucus.

7. Stridor, which is a high-pitched wheezing sound heard during inspiration.

8. Cyanosis, which is a bluish discoloration of the skin due to lack of oxygen.

9. Tachypnea, which is an abnormally rapid rate of breathing.

10. Anxiety, which may be present in severe cases.

11. Loss of consciousness, which may occur in the most severe cases.

12. Death, which may occur if the condition is not treated promptly.

The following are the causes of acute laryngitis:

1. Infection, which may be viral or bacterial.

2. Allergy, which may be to a substance in the environment or to a food.

3. Irritation, which may be caused by smoke, dust, or other pollutants.

4. Overuse of the voice, which may lead to inflammation.

5. Acid reflux, which may irritate the larynx.

6. Trauma, which may be caused by a blow to the throat or by a foreign body.

7. Autoimmune disease, which may cause the body to attack its own tissues.

8. Cancer, which may develop in the larynx.

9. Congenital defects, which may be present from birth.

10. Systemic disease, which may affect the entire body.

11. Medication, which may cause laryngitis as a side effect.

12. Unknown causes, which may be present in some cases.

The following are the complications of acute laryngitis:

1. Chronic laryngitis, which may develop if the acute condition is not treated.

2. Epiglottitis, which is a severe infection of the epiglottis.

3. Peritonsillar abscess, which is a collection of pus in the throat.

4. Ludwig's angina, which is a severe infection of the floor of the mouth.

5. Airway obstruction, which may occur if the larynx becomes severely swollen.

6. Sepsis, which is a systemic infection that can be life-threatening.

7. Death, which may occur if the condition is not treated promptly.

The following are the treatments for acute laryngitis:

1. Rest of the voice, which may help to reduce inflammation.

2. Hydration, which may help to keep the throat moist.

3. Pain relievers, which may help to reduce discomfort.

4. Steroids, which may help to reduce inflammation.

5. Antibiotics, which may be prescribed if a bacterial infection is suspected.

6. Humidification, which may help to soothe the throat.

7. Surgery, which may be required in severe cases.

8. Intubation, which may be necessary to keep the airway open.

9. Tracheostomy, which may be performed if the airway is blocked.

10. Supportive care, which may include oxygen and fluids.

11. Monitoring, which may be required to ensure that the condition is improving.

12. Follow-up, which may be necessary to ensure that the condition has resolved.

if the submucous tissue appears to contain much fluid, the mucous membrane may be scarified with a sharp knife under vision, either with the laryngoscope or the tube spatula.

If obstruction to breathing is threatened preparations must be made for intubation or tracheotomy.

CHRONIC LARYNGITIS

Chronic laryngitis is a chronic change or disease of the laryngeal mucous membrane. It may be caused by local infection, or irritation, or by some constitutional disturbance. Alcohol and tobacco are not infrequent causes.

The appearances in chronic laryngitis vary with the character and position of the trouble. The color is often deeper red than normal, and the surface of the mucous membrane mottled or dry. The vocal cords may take part in the process to a greater or less extent. They may lose their pearly white color and become reddened, dry, or flabby and swollen in appearance.

The trachea or the pharynx and not infrequently both, often show similar conditions to those in the larynx.

The symptoms are a sense of irritation in the larynx, with sometimes a hacking cough. If there is any secretion present it probably comes from below. The voice is often slightly husky, generally only periodically, and is dependent upon the condition of the cords. The symptoms vary in degree at different times, and are liable to subacute exacerbations.

Treatment.—Sources of irritation must be avoided, and the general condition of the patient inquired into. Bland cleansing sprays may be inhaled. In obstinate cases occasional application of a weak solution of nitrate of silver is sometimes advisable.

Chronic atrophic laryngitis in its typical form is secondary to atrophic rhinitis. The disease spreading from the nose involves the mucous membrane of the pharynx and larynx and even the trachea. The relative degree of involvement of these parts varies in different cases. Atrophic laryngitis sometimes occurs independently of atrophic rhinitis.

Diagnosis.—The mucous membrane of the larynx appears dry, and may show adherent crusts. A notable characteristic of the disease is the tendency to temporary exacerbations of the laryngeal symptoms. For periods lasting for a few days to several weeks especially in winter or after severe use of the voice, the larynx becomes red, the voice husky and there is often a sensation of irritation and a dry cough. Under favorable conditions these symptoms may nearly or entirely disappear, to be repeated at longer or shorter intervals. A differential diagnosis must sometimes be made between atrophic and incipient tubercular laryngitis, especially during exacerbations of the former. In atrophic laryngitis there will be the history of previous similar attacks, the presence of atrophic rhinitis or pharyngitis and the absence of ulcerations and other symptoms of tuberculosis.

Treatment.—Rest of the voice should be insisted upon as

much as possible. A moist atmosphere is desirable. This can be aided by evaporating water in the room. A douche or spray of normal salt solution may be used.

PERICHONDritis OF THE LARYNX

The acute infections of the larynx seldom extend to the perichondrium sufficiently actively to be recognized. Occasionally they may do so, causing increased swelling in the arytenoid and cricoid regions, with pain and impairment of motion of the arytenoids. This may go on to localized suppuration with abscess formation. The most frequent causes of perichondritis are syphilis and tuberculosis. In the former there may be simple thickening, or deep ulceration and destruction of cartilage, localized in any part of the larynx. After treatment of the disease there may be contraction and stenosis. Extensive gummatous ulceration is fortunately not common in the larynx. Tubercular perichondritis of the arytenoids and epiglottis is not infrequent in extensive laryngeal tuberculosis. There is irregular swelling and slow superficial erosion of the cartilage. In lupus the swelling is less, the active disease and cicatrization occur together, and in some cases a large part of the epiglottis is destroyed.

SYPHILIS OF THE LARYNX

Secondary syphilis may occur in the larynx in the form of erythema or of mucous patches. These appear at the same time as mucous patches of the fauces and other sec-

ondary eruptions. The voice is roughened or hoarse, and the symptoms those of subacute laryngitis.

Late syphilis in the larynx assumes different forms. A typical gumma may appear in the epiglottis or aryepiglottic fold, or within the laryngeal cavity, with more or less destruction of tissue, and subsequent cicatrization. Except in extreme cases the cartilages generally escape destruction.

Syphilitic ulcers may appear in any part of the larynx. They are generally deeper with more reddened margins and run a less chronic course than tubercular or malignant ulcers.

Both gummatous infiltration and ulcers respond readily to internal treatment.

Condylomata or other hyperplastic tumors of the mucous membrane of syphilitic origin may occur, especially of the false or true cords which resist for a long time both general and local treatment. They mechanically cause serious obstruction to respiration.

Post-syphilitic cicatrices may from contraction produce permanent hoarseness or serious stenosis.

TUBERCULOSIS OF THE LARYNX

Etiology.—The disease is a local infection by the tubercle bacillus. It is commonly supposed that the lesions in the larynx are due to direct infection from tubercular sputa, although the lymph and blood channels are sometimes accused of bringing the bacillus to the larynx.

Tuberculosis of the larynx is very seldom primary, al-

though occasionally it is the only marked tubercular lesion to be found. In the great majority of cases there is also well-marked and oftentimes extensive tuberculosis of the lung. Secondary involvement of the larynx occurs in a considerable

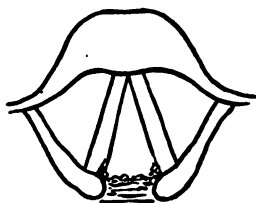


FIG. 54.—Laryngeal tuberculosis: interarytenoid infiltration.

percentage of cases of advanced pulmonary tuberculosis, estimated by different authorities at between three and thirty per cent.

Diagnosis.—As seen in the larynx tuberculosis appears in areas of chronic infiltration and ulceration or both.

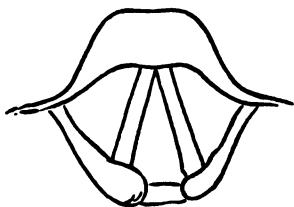


FIG. 55.—Laryngeal tuberculosis: club-shaped arytenoid.

These areas vary in extent from a small suspicious-looking roughness to extensive destruction of a large part of the larynx. The relative amount of thickening and of ulceration varies greatly, one may be extensive without the other.

The infiltration may penetrate deeply, causing great swelling, especially in the region of the arytenoids and epiglottis. The ulceration is superficial, irregular in outline and often pale in color.

In general it may be said that as tuberculosis is the more common of the chronic infiltrating and ulcerating diseases of the larynx, its presence must always be suspected in any chronic localized lesion, until it is proved to be something else.

In incipient cases there are a few local appearances which should arouse suspicion.

The posterior wall of the larynx, often the first part to be attacked, is seen on edge in the laryngeal mirror, where it appears as the interarytenoid space. Any swelling here will be seen between the arytenoids; if extensive it will prevent their complete closure, with impairment of the voice; if ulcerating the margins of the ulcer will show as a rough edge between the arytenoids, giving the so-called cockscomb appearance.

One or both aryepiglottic folds may become infiltrated, in which case there is seen in the laryngoscope what is sometimes called a club-shaped arytenoid. As this fold contains loose tissue, it becomes swollen comparatively easily both from acute and chronic causes. In the latter case there is a strong presumption in favor of its being due to tubercular infiltration. If one side only is affected the difference between the two sides is striking.

A chronic area of slight redness, especially with a dull

surface, on one vocal cord, or just above it on the ventricular band should lead one to suspect a tubercular lesion in the laryngeal ventricle.

Small areas of incipient tuberculosis sometimes appear in other parts of the larynx, as upon the epiglottis. Any unilateral or unsymmetrical inflammatory area should arouse suspicion.

A thickening of the whole epiglottis or of some portion of its margin especially with ulceration should always be suspected.

More extensive lesions will generally be recognized as definite disease, to be distinguished from syphilis, or some benign or malignant neoplasm.

The infiltration is generally more or less irregular. The swelling may be extensive about the arytenoids and the epiglottis, less so in other places. The ulceration is generally shallow, with irregular edges, sometimes almost granular.

Much has been said about the color as a diagnostic point. There is, as a rule, less redness than would be expected with any other disease or inflammation; sometimes there is pallor, especially if the patient is anemic or debilitated. But tuberculosis cannot be ruled out by the presence of color. The amount of infiltration and swelling relative to the amount of ulceration varies very much. The arytenoids, and less often the epiglottis may become swollen to an extent sufficient to cause serious obstruction. Although any part of the larynx may become affected, the posterior portion is the more frequently and the more extensively attacked.

In all suspicious cases if any sputum can be obtained it should be examined for tubercle bacilli. If found they probably come from the lungs, as laryngeal lesions seldom discharge enough to be discovered, but the presence of pulmonary tuberculosis is strong evidence that a chronic laryngeal lesion is also tubercular.

Symptoms.—The symptoms of tubercular laryngitis depend more upon the position than the extent of the lesion. The amount of pain varies from none at all to great suffering. If the arytenoid region is affected there is often pain on swallowing.

A hacking cough may be induced by local irritation or by the adherence of sputum to the diseased area. Hoarseness may be due to involvement of the cords or to a less extent to interarytenoid swelling. In cases of extensive disease the valve action of the larynx may be imperfect, allowing liquids to get into the trachea in swallowing.

Prognosis.—Tuberculosis of the larynx is always a serious complication in pulmonary tuberculosis. The prognosis of the laryngeal lesion, although always grave, is not necessarily hopeless. As in tuberculosis of other locations, it may steadily advance, it may remain with little change for an indefinite time, or it may disappear leaving cicatricial tissue to replace ulceration. The important element in the prognosis is the resistance of the patient to the disease as a whole. This is of more importance than the extent of the local lesion.

Treatment.—Mistakes have been made in the past in over-

treating laryngeal tuberculosis locally. There is no routine application that is advisable in every case. As a rule, the general health of the patient and local rest is of much more importance than any local treatment of the larynx. If infiltration alone is seen without ulceration, local applications are contraindicated. Unirritating sprays either with a watery or oily base may be prescribed. If there are ulcers these may be periodically rubbed with lactic acid fifty to seventy-five per cent. to which may be added two per cent. of formalin. This rubbing should be attempted only by skilled hands, taking great care not to abrade healthy mucous membrane. It should be repeated not oftener than once a week. Sprays similar to Dobell's or Seiler's or solutions in oil of menthol, creosote or other substances or inhalations of iodoform or other powders are often recommended. Irritation does more harm than cleansing does good, local rest is desirable, but the important treatment is the general welfare of the patient.

If the disease is far advanced and gives rise to local pain or dysphagia, it may be treated locally by orthoform in powder or lozenge, or if possible by surgical removal of diseased tissue. Infiltrated, swollen and ulcerated arytenoids, or parts of the epiglottis, may be punched off with biting forceps. Tubercular masses or tumors which are sufficiently circumscribed, should generally be removed surgically.

Good results have been reported from treatment by direct sunlight, introduced by reflecting mirrors.

If pain is a serious symptom it may be relieved by injecting alcohol into the superior laryngeal nerve at the spot where it pierces the thyrohyoid membrane. By careful exploration with the subcutaneous needle at this point the patient feels a sharp pain when the nerve is touched. The alcohol is then injected.

Lupus of the larynx is seldom primary, but is generally an extension from the pharynx. The epiglottis is the part most frequently involved. It becomes thickened, often not obviously ulcerated, and ultimately largely destroyed and cicatricial. The disease may spread down the aryepiglottic fold and to the interior of the larynx, to the ventricular band. The vocal cords are involved only in very extensive cases.

STENOSES OF THE LARYNX

Acute stenosis of the larynx may be caused by the false membrane of diphtheria, by any inflammatory disease in which the mucous membrane becomes swollen or edematous, by foreign bodies or trauma. Chronic stenosis may be the result of syphilis, tuberculosis, lupus or some other infiltrating disease, the obstruction of a new growth, trauma, injury from an intubation tube, a congenital web between the cords or abductor paralysis.

Cicatricial stenosis is generally caused by the contraction following the healing of a gummatous ulceration. It may form a circular stricture or a web between the cords or in the subglottic region. The cartilages of the larynx are

sometimes partially destroyed by syphilis, allowing a collapse of the walls of the laryngeal cavity. Stenosis follows intubation in a small proportion of cases, due probably to abrasions made by the tube.

In abductor paralysis the glottis is unable to open on account of the failure of the posterior cricoarytenoid muscles.

The important symptom of stenosis is obstruction to respiration, more marked on inspiration than expiration. The nature of the stenosis can generally be seen in the laryngoscopic mirror.

In the treatment of chronic stenosis which is causing serious obstruction tracheotomy is generally necessary to guard against asphyxia. Subsequent treatment depends upon the nature of the stenosis. The direct treatment of cicatricial stenosis is difficult and tedious. Bands or webs may be cut, but are apt to re-unite unless systematically dilated afterward. Dilatation of the stricture in the larynx has been done by the passage from above of special, hollow, hard rubber sounds of different sizes introduced periodically by the physician or even by the patient.

The wearing of rubber intubation tubes for a prolonged time, months or years, sometimes results in a permanent cure. The tubes are gradually increased in size, and to keep them in place are attached through a tracheotomy incision to a band about the neck. A few cases have been reported where after other means had failed a passage was established by making an external incision, sewing the

mucous membrane to the skin and laying a rubber tube or piece of wood along the lumen of the stenosed larynx or trachea. The open wound is maintained until the foreign body has been surrounded by an epidermatized canal, after which the external opening is closed. The process is tedious and not devoid of danger.

SINGERS' NODES

On the free margin of the vocal cords are sometimes seen small elevations, one on each cord, known as vocal nodules, or more commonly singers' nodes, because public singers are especially liable to them. Though generally bi-lateral and symmetrical, one nodule may be larger than the other. They occur at a point half way between the

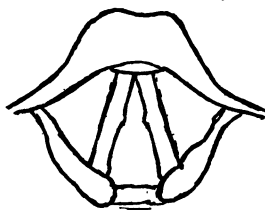


FIG. 56.—Singers' nodes.

tips of the vocal processes and the anterior extremities of the cords.

Etiology.—The cause of the formation of these nodules is generally explained as follows: The cords during phonation should be straight and parallel. On high notes the vocal processes are held together and the cords vibrate between them and their anterior attachments, the maximum

vibration being half way between the two. If the voice is strained when the cords are relaxed there may be an irritation at this point resulting in a slight swelling on each cord. Excessive use of the voice in this condition may cause friction between the two cords resulting in thickening of the epithelium or the deeper parts of the mucous membrane. Nodes thus formed may easily chafe each other during phonation, preventing a return to normal. Once established, these nodes tend to persist, often enlarging in case of acute inflammation or excessive use of the voice, and diminishing when the cause of irritation is removed.

Among professional singers, nodes occur much more frequently in women than in men.

Nodes are not infrequently seen in children, especially boys. As a rule they appear relatively larger and softer than in adults, and disappear during adolescence with the change in voice. They differ from similar nodes of adults in containing, and perhaps being largely due to, glandular tissue.

Diagnosis.—The history will usually show excessive or badly regulated use of the voice. On examination the nodes will be seen, varying from a small, somewhat rounded or pointed excrescence from the free edge of the cords to a considerable thickening of the cords. They are usually of the same color as the cords, but there may be a slight darkening or reddening of the cord in the neighborhood.

The symptoms are almost wholly vocal. There is a lack of clearness of tone, which if slight is often more noticeable

in the speaking than in the singing voice. It is necessarily a constant impediment to a professional singer, especially as the size of the nodes and consequently the vocal disability is liable to sudden temporary increase at any time. Some parts of the voice are more affected than others.

In children the only symptom is a constant harshness to the voice, both speaking and singing, sometimes worse than at other times but never entirely disappearing.

Treatment.—The essential treatment is the proper use of the voice, avoidance of vocal strain, and special vocal exercises. The trouble was originally caused by bad vocal methods and all danger of a repetition of this must be avoided. Locally any laryngitis should be treated. The question may arise of removing the nodes surgically. Except in extreme cases this should not be attempted, and even then not without careful consideration in each case.

When nodes are once established the prognosis for complete disappearance of all tendency to swelling at the nodal points is not good. If the voice is much used the cords seldom become absolutely parallel with each other.

PACHYDERMIA LARYNGIS

This is a circumscribed thickening of the epithelium of the vocal cords over the vocal processes. Though generally bilateral, it may be larger on one side than the other. The thickened areas appear as elevations opposite each other in inspiration, in contact when the glottis is closed. When the two come together there is often a concave facet on

one or both sides, which is characteristic. One side may be cupped, while the other is a rounded elevation fitting into it.

The cause of pachydermia is obscure, but it is probably due to localized chronic inflammation or irritation from friction, of the nature of a "corn" of the skin.

The symptoms are slight, except for more or less harshness of the voice.

Treatment is unsatisfactory. All rough use of the voice should be prohibited. Sprays and local applications produce little effect. Surgical removal is generally contraindicated.

CONGENITAL LARYNGEAL STRIDOR

Sometimes an infant who in other respects appears normal, is noticed shortly after birth to make a croaking sound during inspiration, which becomes a high pitched crow when a more forcible inspiration is taken. Expiration may be accompanied by a short croak when the stridor is loud, but at other times it is noiseless. Emotional excitement or any physical cause of deeper breathing such as exposure to colder air, or the act of crying, may intensify the sound. The child's power of crying and coughing is unaffected. Although the breathing is noisy it is not accompanied by the slightest distress and there is no cyanosis. The stridor increases during the first few months and after remaining about the same for a few months more it gradually lessens and finally disappears during the course of the second

year of life. Symptoms due to adenoids differ essentially from typical congenital laryngeal stridor, which is not relieved by their removal. An enlarged thymus may cause noisy breathing but tracheal obstruction is accompanied by dyspnea and cyanosis, laryngeal stridor is not. In the latter the noise is due to a congenital peculiarity of the upper aperture of the larynx. The epiglottis is curved backward with its lateral borders almost in contact and the arytenoid cartilages and aryepiglottic folds are approximated so that the upper aperture of the larynx is represented by a slit. The sound is produced mainly at the abnormally approximated aryepiglottic folds.

The stridor is very marked in deep anesthesia. It takes place at the entrance of the larynx by the vibration of the soft structures on the posterior wall. The vocal cords take no part in its production. Variation in stridor is often due to the relative position of the tongue.

CHAPTER XVI

NEUROSES OF THE LARYNX

THE superior laryngeal nerve supplies sensation to the larynx and also motion to the cricothyroid muscle. The inferior or recurrent laryngeal supplies motion to the other intrinsic muscles. The arytenoideus is supplied by both nerves.

SENSORY DISTURBANCES

Disturbances of sensation may result in hyperesthesia, anesthesia or a feeling of irritation of the laryngeal mucous membrane. It is difficult to separate those cases in which the nervous system is at fault from those due to local inflammation, the latter being much the more common cause of the discomfort.

Neuritis of the superior laryngeal nerve may follow an acute laryngitis or it may be an extension of a neuritis from other nerves. The principal symptom is pain or discomfort referred to the larynx, increased by the motions of swallowing when nothing is swallowed, but not by the passage of food, the reverse of the dysphagia due to inflammation of the arytenoids. Another essential element in the diagnosis is the presence of a definite spot sensitive to pressure between the greater cornu of the hyoid bone and the upper

edge of the thyroid cartilage in the lateral part of the thyrohyoid membrane where it is pierced by the nerve. The patient will sometimes point out this spot as the seat of his trouble, in other cases it is discovered by careful manipulation, especial attention being given to the relative sensations of each side.

Treatment by massage is often effective.

MOTOR DISTURBANCES

Paralysis of the superior laryngeal nerve by preventing the contraction of the cricothyroid muscle, causes relaxation of the cords. Lack of tension may also be caused in other ways. Such a paralysis, therefore, is clinically difficult to demonstrate.

Paralysis of the recurrent nerve may be partial or complete, unilateral, or bilateral, of central origin, or due to pressure upon or injury to the nerve itself. If one nerve only is affected, the loss of motion will be upon the corresponding side of the larynx only, if both are equally affected the paralysis will be bilateral.

The vocal cords are adducted, closing the glottis, by the lateral cricoarytenoid and other muscles. They are abducted, opening the glottis, by the posterior cricoarytenoid muscles only. Abductor and adductor fibers are both contained in the recurrent nerve.

The following observation is commonly known as *Semon's law*: "In partial impairment of motion in the larynx, abduction is affected before adduction." Consequently in

progressive paralysis, the posterior cricoarytenoid muscle is the first involved, causing abductor paralysis or the German "Posticuslaehmung." In complete paralysis all muscles supplied by the recurrent nerve become immovable, causing paralysis both of abduction and adduction.

Abductor Paralysis.—This may be unilateral or bilateral. It may be caused by disease or pressure, or injury in the central nervous system or in the course of the nerve itself.

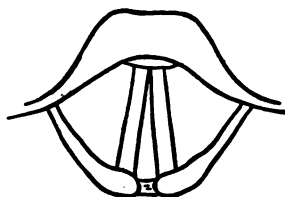


FIG. 57.—Bilateral abductor paralysis during inspiration.

A frequent cause is locomotor ataxia. In this disease it may be an early symptom, it may occur in any degree, but it may be entirely lacking.

If unilateral, the cord on the affected side is limited in its abduction during inspiration. If bilateral, although in phonation the cords appear normal, in inspiration the opening of the glottis is incomplete. As the paralysis of abduction increases the respiration becomes embarrassed and noisy and there is danger of asphyxia from obstruction to breathing in an exacerbation of the paralysis.

There is nothing that can be done locally until it becomes necessary to guard against asphyxia by tracheotomy.

Complete Paralysis of the Recurrent Nerve.—This is generally due to pressure upon or destruction of some part of the nerve itself. It may, however, arise from inhibition of the vagus above the branching of the recurrent nerve, or from the central nerve center.

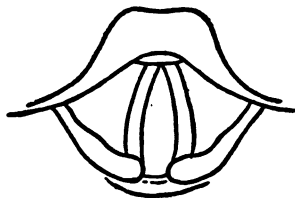


FIG. 58.—Complete bilateral paralysis of the recurrent nerve. The cords are in the cadaveric position.

The paralysis occurs more often on the left than on the right side, on account of the greater length of the left recurrent nerve and its liability to injury in cases of aneurism of the arch of the aorta. In fact one of the first symptoms

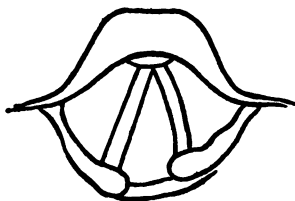


FIG. 59.—Complete paralysis of the left recurrent nerve as seen in the laryngoscope during inspiration.

of this aneurism is sometimes left-sided paralysis of the larynx.

If the inhibition of the nerve is complete the vocal cord on that side will be seen in the laryngeal mirror to be im-

movable between abduction and adduction, somewhat bowed and apparently shorter than the normal cord, and often with the arytenoid of the affected side drooping forward. This position of the cord is called the *cadaveric position*. If one side only is paralyzed the unaffected cord abducts normally in deep inspiration and on phonation adducts even beyond the middle line, so that it often succeeds in phonating pretty well with the immovable cord.

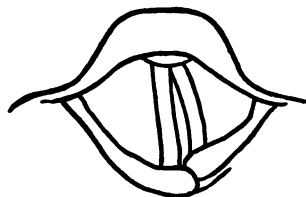


FIG. 60.—The same during phonation.

The prognosis of paralysis of the larynx depends upon its cause. This can often not be determined. It sometimes disappears after a shorter or longer time without the cause having been found.

SPASM OF THE GLOTTIS

This is a spasmodic closing of the glottis, with obstruction to respiration and the feeling and appearance of imminent asphyxia. It may be caused by the inhalation of irritating substances, by acute inflammation, or by a reflex nervous impulse from some cause outside of the larynx. It sometimes happens that spasm of the glottis, the original attack of which was caused by the inhalation of some irri-

tant or foreign body, becomes established as a periodic habit and is induced by any mild irritant or even without obvious exciting cause. The glottic spasm may cause not only great distress but even deep cyanosis; it is, however, rarely fatal. When asphyxia begins the spasm yields and allows respiration to continue.

The attacks are often so sudden that little time is given for treatment. If there is any premonition of an attack it may be avoided by soothing inhalations.

Laryngismus Stridulus which resembles this condition is described under "Croup."

LARYNGEAL VERTIGO

A form of recurring glottic spasm is known as laryngeal vertigo or *laryngeal epilepsy*. The symptoms resemble those of simple spasm except that there is added to them a short loss of consciousness or mental confusion. Some of these cases are undoubtedly true epilepsy in which laryngeal symptoms play the conspicuous part.

HYSTERICAL APHONIA

This is a curious psychic disturbance in which the patient appears to be unable to speak above a whisper, although the larynx is otherwise entirely normal. This aphonia may last for days and weeks and even months. On the other hand the voice may suddenly come back at any time, and except in extreme cases can be brought back in a few minutes by proper treatment, often to the great surprise of the patient.

It occurs much more frequently in women than in men, but a typical case is occasionally seen in a man. Although called hysterical, and sometimes associated with other neurotic disturbances, it is not necessarily so. It does not in itself denote any serious mental or nervous instability.

The most frequent cause is an acute laryngitis which so affects the larynx that it is painful to speak aloud, and the whispering voice thus established persists after the laryngitis has completely disappeared. It sometimes follows mental shock, nervous excitement or a blow on the head.

The diagnosis is made by finding that the larynx is entirely normal, but the cords, although moving freely, decline to remain in the position for phonation. By asking the patient to cough not only does the glottis close properly, but the sound made by the cords shows that they are capable of normal phonation. Even when the patient understands the condition, it may be impossible for her to take control of her voice without outside help.

Treatment consists in surprising the patient into making a sound and then in repeating the sound immediately a few times, until the voice no longer tends to relapse to a whisper. In this way a voice which has been whispering for weeks may be restored in a few minutes, and remain normal, except that a recurrence of the cause may again bring on the aphonia.

Cases differ much in the ease with which the voice can be restored. Sometimes a laryngological examination will

do it, or a slight lateral pressure of the larynx as the attempt at phonation is made. In more persistent cases, a faradic current or the inhalation of ether just to the point of unconsciousness with suggestion as consciousness returns will often be effective.

DEFECTS IN SPEECH

Speech is dependent upon the speech center in the brain. For the development of the speech center and for the control of speech the perception of sound by the ear is almost essential. That it is not absolutely necessary has been shown by the education of speech in deaf mutes.

An impediment or backwardness or other abnormality in speech may have its seat in any of the organs concerned in speech production, the ears, the speech center, the medulla, the larynx, the tongue or palate. A study of the nature of the impediment will generally show the location of the disturbance.

A deaf child can not hear and copy the speech of others nor correct or edit his own voice sounds.

If the speech center is defective or becomes damaged the power of talking or putting together the proper words will be defective.

Even if the appropriate ideas and words are formulated there may be a defect in the way in which they are spoken due to trouble in co-ordination, as in stammering.

There may be a defect in the mechanism or in the nerve supply of one of the peripheral sound-producing organs.

It is important to differentiate these defects in order to establish proper treatment and to avoid unavailing and disappointing operations for impediments in speech which from their nature can not be helped in this way.

Some of the more common defects are as follows:

Backwardness in Speech.—This may be due to lack of normal cerebral development, but as it is not infrequent in normal children, a careful study must be made of each case. A normal child in learning to speak will sometimes substitute one sound for another. Up to a certain degree this results only in a lisp or other accent, and does not interfere with an intelligible word formation. If however, there are several sound substitutions, the words which the child thinks he is saying are unintelligible except perhaps to his mother. If another common defect, clipping the ends of the words, is added, his speech becomes hopelessly unintelligible and the child is erroneously looked upon as half-witted. A child may repeat fairly correctly each letter of the alphabet separately but still substitute one sound for another in speaking. The defect here is a faulty habit of the central speech production, including the correcting or editing function of the ears.

Treatment.—The treatment for an impediment or backwardness in speech must be by education. If the child is mentally deficient he must be treated accordingly. If his speech only is at fault he must be patiently trained, first in the correct production of each of the different sounds, and then in properly combining them.

Stammering.—This might be called an articulatory spasm. The proper words are formulated but are held up in the co-ordinating nervous system before reaching the mechanical mechanism. Its treatment demands special instruction.

Falsetto Speech.—At puberty the boy's larynx increases rapidly in size, the vocal cords become longer and the tones produced correspondingly lower. By a curious psychic process, a boy as if afraid of his new deep voice, will occasionally continue to speak in a high pitch, by the use of what is known as falsetto, when long cords vibrating only in part produce the tone of a small larynx. This condition may be suspected when a young man's voice is absurdly high, or when it alternates between deep and high. It is easily cured by proper vocal exercises.

Defects in Speech of Peripheral Origin.—These may be caused by defects in the larynx, palate, tongue or lips or by an obstruction in the pharynx, nose or mouth.

Defects in the larynx affecting the vocal cords produce varying degrees of hoarseness up to complete aphonia or whispering voice. These defects may be either mechanical or nervous. The former include acute and chronic inflammation and infiltration and ulceration of different diseases or tumors. The latter are due to paralysis of the laryngeal nerves or some functional neurosis.

Defects of the palate may be due to a congenital cleft or destruction of tissue from syphilis or trauma, or paralysis generally the result of diphtheria. By a failure of the palate

to close the post-nasal passage, a peculiar form of speech results in which the sounds of *k* and hard *g* are especially affected.

Defects of the tongue whether due to swelling, trauma, or to trouble with its nerves as in bulbar paralysis, produce a speech in which the sounds of *d*, *j*, *l*, *n*, *r*, *s* and *t* are especially affected.

A *defect of the lips* which is comparatively rare, would affect especially the sounds of *b*, *f*, *m*, *p* and *v*.

An obstruction in the nasopharynx as in adenoids, prevents proper head resonance to the voice and dulls especially the nasal sounds of *m* and *n*. The same is true of obstruction in the nose itself.

Treatment of all of these peripheral causes of impairment of speech must be that of the conditions causing them. An important duty of the physician is to study the case thoroughly enough to be reasonably sure of his diagnosis before promising good results from his treatment.

CHAPTER XVII

TUMORS OF THE LARYNX

POLYP OF THE VOCAL CORDS

THIS is a small, soft, round tumor, more or less pedunculated, of the size of a small pea or smaller, growing from the surface or margin of a vocal cord, generally on the anterior third. It frequently, especially if it has a well-defined pedicle, gets between the cords in phonation, causing a peculiar hoarseness. It varies in color from red to white. It is composed of modified mucous membrane, firmer on the surface, but soft and almost fluid in the center, resembling a cyst. It is friable and seldom returns after removal.

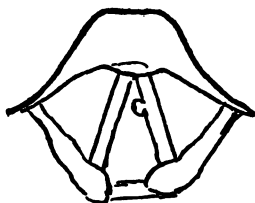


FIG. 61.—Polyp of the vocal cord.

Treatment consists in cocainizing the larynx and seizing and removing the growth with forceps.

Fibroma is similar in size and shape to a polyp, but much less common. It is hard, and may be so firmly attached that a cutting instrument is necessary to remove it.

PAPILLOMA OF THE LARYNX

In childhood typical papilloma occurs in the larynx as a multiple growth resembling cauliflower in appearance, attached by slender pedicles to the mucous membrane in the neighborhood of the anterior commissure. Later it extends to other parts of the larynx, the epiglottis and even the trachea. It may appear at any time in infancy or childhood, but it is more common between the third and eighth years. The rate of growth varies in different cases.



FIG. 62.—Papilloma of the larynx in childhood.

It may be weeks or months after the beginning of hoarseness before the breathing becomes embarrassed, sometimes in older children there may be slight obstruction for years.

There are two distinct periods in the history of the growth, the first of increase or recurrence, the second of quiescence or disappearance. During the first period which commonly lasts from one to three or four years, the tendency of the growth is to increase or recur if removed. Irritation appears to stimulate recurrence and abrasions of previously healthy mucous membrane of the larynx or trachea are often the seat of later papillomatous growths.

After the second period is reached increase is slow

and finally ceases, the growths if removed do not recur, and small growths disappear without removal.

It is possible that the tendency of the growth at first to recur actively, then to remain stationary and finally to disappear is to be explained by an acquired immunity on the part of the child.

Symptoms and Diagnosis.—The first symptom is hoarseness, gradually increasing and becoming aphonia. Sometimes a peculiar sound as the pedunculated growths flap to and fro during respiration is heard. As the growth increases obstruction to breathing arises which may result in cyanosis and asphyxia. The diagnosis is not difficult if the interior of the larynx is seen. This is generally easily accomplished by direct laryngoscopy. If not, a probable diagnosis, made by exclusion, warrants preparations for operating. Under an anesthetic the larynx can always be seen with a tube spatula.

Treatment.—Papilloma is a serious disease, in which good judgment, skill and patience may make the difference of life and death. The older and more tractable the child the better the prognosis. After the vicious tendency to recurrence has passed the problem becomes comparatively simple.

If the amount of papilloma is small relatively to the size of the larynx there is hope that the growth may be removed without a previous tracheotomy, and that any recurrence will be slow enough to be kept in check. It must, however, be remembered that the irritation of operating

may increase the tendency to recurrence. The operation under a general anesthetic is as follows. A previous injection of atropine is advisable. The child after being anesthetized is put on his back with the head hanging over the end of the table and supported. A laryngeal spatula or speculum is inserted behind the epiglottis, and the interior of the larynx brought into direct view and cocaineized. Pedunculated masses are then carefully removed by seizing them with forceps, or cutting through the pedicles with a fine wire snare. It is important that the normal mucous membrane of the larynx should not be wounded.

If the larynx is small, as in a child up to four or five years of age, or if the growth springs from an extensive surface, even if operating without a previous tracheotomy be possible, it may not be advisable on account of the subsequent danger of obstruction to breathing from acute swelling or from recurrence of the growth. If the growth shows extensive attachments or great tendency to recur the safest course is a tracheotomy preliminary to other treatment. If it is probable that a tracheotomy will at some time have to be done, it is better to do it before removing the growth. In this way the danger of a hurried tracheotomy is avoided, and the removal of the growth can be undertaken under better conditions.

If a tracheotomy tube has been put in, it should be left in until the stage of vicious recurrence is passed or until it is certain that the recurrence is under control. This may

be months or years. It is better to wear the tube longer than necessary rather than to risk the danger of a second tracheotomy.

Tracheotomy is frequently followed by the growth of papilloma in the trachea from the margin of the tracheotomy wound or other part of the mucous membrane which has been injured. This growth can generally be controlled but occasionally becomes a serious problem.

After tracheotomy it is better to be conservative in the local treatment of the growth. Nothing should be attempted until the child has become accustomed to the tube. Then under an anesthetic large and pedunculated masses may be removed with forceps or snare, care being taken not to wound any healthy mucous membrane. The final results are often better if but little interlaryngeal operating is done after tracheotomy.

If a tracheotomy tube has been worn for some months there may be left after its removal an opening through the wound into the trachea. This fistula is allowed to remain as long as there is any possibility that the trachea may have to be opened again, and it can ultimately be closed by dissection of the fistula, and suturing the skin flap.

Different applications, such as alcohol, lactic acid and formalin have been recommended as local applications, but they are generally entirely inefficient.

Electrolysis has been successfully used for local destruction of the growths.

Papilloma in Adults.—Under this head may be included children who can tolerate operation under cocaine. Papilloma is less liable to rapid and extensive growth in adults, and the danger of recurrence is less. It may be single and pedunculated or multiple and more sessile. Its more common seat is the anterior part of the larynx, or in the neighborhood of the cords. Hoarseness depends upon the amount of the mechanical interference with the movements of the cords.

It is sometimes said that papilloma may become malignant, but it is more probable that in some cases it is the first evidence of infiltrating disease at its base. This possibility must lead to a guarded prognosis and careful watching especially after middle life, and when the papillomata are sessile and multiple, and especially when they protrude from the laryngeal ventricle.

Treatment.—Most adults will tolerate removal of the growths under local anesthesia with cocaine. Patience on the part of the physician and the patient is often required.

The epiglottis and the interior of the larynx is cocaineized by a few applications of ten or twenty per cent. solution of cocaine on a cotton carrier. It is important that the cotton should be so firmly attached to the carrier as to obviate any danger of its coming off in the larynx. A little adrenalin solution should be added to increase the duration of the anesthesia. By the older method of removal the patient holds the tongue, the physician uses a laryngeal mirror in his left hand, to bring the larynx into view, while

with his right hand, forceps with a right-angle bend are passed into the larynx and the growth seized under the guidance of the reflected view of the larynx. The forceps generally used are those of Mackenzie or the tube forceps of Schroetter. The growth being friable generally comes away with but little resistance. Force must not be used and the operator should always see what he has in his grasp.

If the tolerance of the patient, the character of the growth and the skill of the operator allow, this method of removal is entirely satisfactory. In recent years the tube spatula has made possible direct inspection and removal of the growth. It shortens the distance and allows the use of straight instruments. If a general anesthetic is necessary, the direct method is better, under local anesthesia the indirect is easier for the patient, and often for the operator also. If forceps are inadequate, the growth may be removed with cutting forceps, wire snare or curette. With these instruments it is even more important than with forceps, to see exactly what the instrument is doing, to avoid injury to normal tissues. If a good view can not be obtained, or if the instruments can not be carefully used with cocaine, a general anesthetic is indicated, in which case the direct method is the only one to be considered.

In case any question of possible malignant base arises, it is seldom advisable to risk interlaryngeal irritation. It would give the best chance for ultimate good results to do a thyrotomy, prepared to take out any infiltrating disease which was found.

THYROGLOSSAL CYST

The **thyroglossal duct** is the embryological connection between the base of the tongue and the thyroid gland. It runs from the foramen cecum on the tongue, downward in

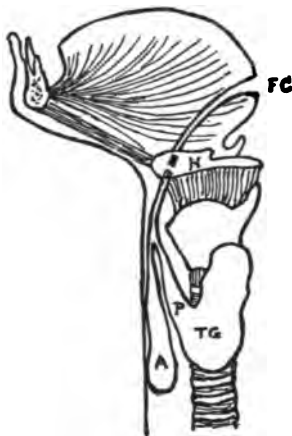


FIG. 63.—Diagram showing the course of the thyroglossal duct, parts of which may result in a median cervical fistula, an abscess sac, or an accessory thyroid gland at the base of the tongue (after Marshall). FC, Foramen cecum; H, Hyoid bone; TG, Thyroid gland; P, Pyramid of thyroid gland; A, Abscess sac.

the middle line just behind the anterior portion of the hyoid bone and in front of the thyrohyoid membrane and larynx, toward the isthmus of the thyroid gland. As a duct it is normally obliterated before birth, but parts of it may persist. The lower subcutaneous portion may fill with mucus, become dilated at one point, and appear under the skin as a cyst. If it ruptures or is opened a fistula remains which

discharges a mucoid secretion, therefore if it is small it is better not to open it. The fistula is difficult to obliterate. In dissecting it out the surgeon is led up behind the hyoid bone and may find it necessary to divide this in order to complete his dissection. Islands of thyroid gland may develop from any part of the course of the obsolete thyroglossal duct, but especially from its upper end as has been described under tumors of the pharynx.

CANCER OF THE LARYNX

Cancer of the larynx may be extrinsic or intrinsic. An extrinsic growth is one which either originating outside of the larynx, invades its cavity, or which has become so extensive that it is no longer confined to the laryngeal cavity. An intrinsic growth is one which is confined to the cavity of the larynx.

The more common form of intrinsic malignant tumor is epithelioma, although other forms of carcinoma and sarcoma may occur. The patients are generally, although not always, elderly men. It may begin superficially, generally on one cord, or more deeply, often in connection with the ventricle.

The symptoms are a slowly increasing hoarseness of voice, occasionally local pain. After it has become extensive, obstruction to breathing and dysphagia appear.

On inspection, if the disease is superficial, an infiltrated slightly elevated area will be seen, sometimes covered with a characteristic shaggy white surface. If the disease is

deeper, there will be a swelling of one ventricular band, a partial immobility of the affected cord or a protruding mass from the ventricle. Any chronic infiltration which shows no symptom of syphilis or tuberculosis should be carefully studied. An early diagnosis of cancer of the larynx is of the greatest importance, because in the early stages an operation for its removal offers a good chance for permanent cure.

A positive diagnosis can sometimes be made by removing a piece for microscopical inspection. But in most cases this proceeding is to be condemned. If there is a reasonable suspicion of incipient malignant growth interlaryngeal meddling is to be avoided.

Treatment.—The treatment for an intrinsic cancer of the larynx is to remove it by *thyrotomy*. Under general anesthesia an incision is made from just above the thyroid notch to the cricoid. The anterior angle of the thyroid cartilage having been exposed, an opening in the cricothyroid membrane is made, and through this a solution of cocaine and adrenalin is applied to the interior of the larynx. The thyroid cartilage is then divided in its median line and the two wings retracted, opening the cavity of the larynx. The growth is then dissected out with as much tissue as is necessary to insure complete removal, all bleeding stopped, the cut edges are carefully brought together with one or two catgut sutures, taking care that none of them go into the laryngeal cavity.

In the earlier operations tracheotomy was always done in

connection with simple thyrotomy, and this is still the habit of several operators.

If the growth is not confined to the soft parts of the interior of the larynx, a partial or complete extirpation of the larynx must be undertaken, a much more formidable operation and with greater danger of recurrence.

CHAPTER XVIII

INTUBATION AND TRACHEOTOMY

INTUBATION

INTUBATION of the larynx is indicated in most cases of laryngeal diphtheria causing dyspnea. It is applicable in other cases also where there is obstruction due to swelling of the mucous membrane of the interior of the larynx, or abductor paralysis of the cords. It should not be done if there is a foreign body, neoplasm or infiltration of cancer or tuberculosis.

The O'Dwyer set of instruments consists of a gag, an introducer, a set of intubation tubes, an extractor and a graded scale, by which a tube of the proper size for the age of the patient may be selected. The patient is generally in the upright position, held by a nurse. The proper tube is attached to the introducer and threaded with silk. The gag is put in and the operator passes his left forefinger over the tongue and behind the epiglottis until he feels the vestibule of the laryngeal cavity. Taking the introducer in his right hand he passes the tube into the larynx under guidance of the left forefinger. He then releases the tube and withdraws the introducer, while with the left forefinger he feels that the tube is in the larynx and not in the esophagus and pushes it down if necessary, so that the shoulder of the tube engages in the upper part or vestibule

of the laryngeal cavity. The tube should fit snugly. If it is too small it will be coughed out, or there may even be danger that it will slip through the larynx into the trachea. If the dyspnea is not relieved there is a possibility that a piece of membrane may have been pushed down with the tube and blocked it. The tube should then be withdrawn and either replaced, or in case of emergency tracheotomy should be done.

The patient should be watched after intubation, as the tube may be expelled or become blocked. When these dangers are remote the string which is attached to the tube and which comes out of the patient's mouth may be removed. The tube may be left in indefinitely, but in diphtheria it can often be removed in three or four days. This is done by introducing the extractor under guidance of the finger, seizing the tube and withdrawing it. The patient should be watched until all danger of recurrence of the obstruction has passed.

Direct Intubation.—If the interior of the larynx is brought into view by direct laryngoscopy a tube may be passed into the larynx under guidance of sight. To pass an intubation tube in this way a straight introducer is needed. But a long straight tube of small caliber, or even a catheter may be passed through the speculum into the larynx and trachea in cases of emergency, and respiration maintained until more permanent means can be taken. This is especially applicable when the patient is under a general anesthetic, or with infants.

TRACHEOTOMY

Tracheotomy is indicated in cases of serious dyspnea from obstruction in the upper respiratory tract which can not be relieved by intubation, and in cases of foreign body in the trachea or bronchi which can not be reached by upper bronchoscopy. The upper part of the trachea is superficial, but as it descends it becomes deeper until it disappears behind the sternal notch. About half way between the cricoid cartilage and the sternal notch it is crossed by the isthmus of the thyroid gland, which it is advisable although not absolutely necessary, to avoid. If the trachea is opened above the isthmus it is called high, if below it, low tracheotomy. In high tracheotomy the trachea is easier to reach and the wound is in a better place, it is therefore preferable except in those cases in which there is some special reason for the lower operation.

In urgent cases it may be necessary to dispense with anesthesia. If time permits, local anesthesia by the subcutaneous injection of cocaine or one of its substitutes with adrenalin is generally preferable in adults and sometimes in children. If a general anesthetic is used it must be given carefully, especially in cases of laryngeal obstruction, as the dyspnea may be so increased by the anesthetic that a hurried operation becomes necessary.

The patient should be on his back, with the shoulders raised and the head fully extended and held by an assistant exactly in the middle line. As the most frequent mistake made in doing the operation is to miss the median line and get

to one side of the trachea, this exact position of the patient is important. The operator marks the skin with his scalpel in the exact median line, seizes the thyroid cartilage with his left hand and makes an incision from the thyroid cartilage downward for about two inches, through the skin and superficial fascia. The bleeding should be stopped and the dissection continued as far as possible by blunt dissection, always in the median line, pushing aside the longitudinal muscles, and taking care to find the thyroid isthmus, and separate it from the trachea so that it may be retracted downward, without cutting. Dissection is aided by occasional palpation with the forefinger to locate the trachea. When the upper tracheal rings are exposed, the bleeding stopped and the edges of the wound retracted, a sharp hook is placed just below the upper ring of the trachea, and this is pulled upward and outward, stretching the trachea and preventing it from moving away. An incision is then made in the middle line of the trachea including two or three rings. The operator must be sure that he is not dividing the cricoid cartilage and it is generally better to avoid the first tracheal ring also. If a tracheotomy dilator is at hand it is then introduced into the incision and this is held open until bleeding and reflex coughing has subsided and the tracheotomy tube can be introduced through it, or the tube may be put in immediately after the incision. The upper and lower edges of the skin wound may be brought together with stitches. The tube is held in place by a tape around the neck. A piece of loose moistened gauze should be placed over the

tube and occasionally renewed for a few days after the operation, until the lower respiratory passages have become accustomed to the new conditions of respiration. After this no covering is needed.

If the condition which made tracheotomy advisable is immediately removed, as in the case of a foreign body, the external wound should be kept open at first to prevent emphysema from the leaking of air through the tracheal incision. After a tube has been worn for a few days this precaution is no longer necessary. The inner tube may be freely removed for cleaning and replaced. If the outer tube is removed, it may be easily replaced if necessary by threading through it the end of a flexible bougie, and allowing this to protrude two inches. This will guide the tube through the wound and into place, after which the bougie is withdrawn.

CHAPTER XIX

BRONCHOSCOPY AND ESOPHAGOSCOPY

THE passage of straight tubes into the trachea and bronchi and into the esophagus and stomach is in many cases of the greatest value for diagnosis, the removal of foreign bodies and treatment of certain local conditions. The instruments and apparatus are necessarily rather complicated and require practice and skill in their use. At present there are two principal sets or systems of instruments, one introduced or adapted by Brünings in Europe, and the other by Jackson in America. The former continued the work of Killian, who was the pioneer in systematic bronchoscopy, the latter introduced the distal light into Killian's instruments. Both have elaborated and advanced the equipment and technique, which has been added to by individual contributions of others.

For throwing sufficient light down a long and slender tube the reflecting head-mirror is inadequate. Brünning's tubes are lighted from the outer end by an electric lamp and reflector. In Jackson's tubes a small electric lamp is placed near the distal end, consequently in the immediate neighborhood of the field to be explored. Instruments for the extraction of foreign bodies, for sponging, or for bron-

chial or esophageal operating must be adapted for use through the tube. The patient, if not under a general anesthetic, may sit on a low stool with the examiner in front of, and above, him. The patient's shoulders are supported, and his head thrown back. Or he may lie on his back on a table with the head extended downward over the end, and held by an assistant. If the patient is under a general anesthetic the latter position only is available. The tube is introduced either directly or through a speculum. The larynx and trachea should be cocainized before anything is passed into them, even if the patient is under a general anesthetic. Under no circumstances must force be used, except sometimes to open the jaws. Whether or not a general anesthetic is necessary must depend upon the patient, the skill of the operator, and the problem at hand. If it is given it should be preceded by a subcutaneous injection of atropine and morphine.

BRONCHOSCOPY

The direct inspection of the bronchi is possible in one of two ways, called respectively lower and upper bronchoscopy.

Lower bronchoscopy can be done only after tracheotomy, the tracheal opening being used as a short cut to the bronchi. The important fact upon which lower bronchoscopy is based is that the air passages are so flexible that a straight tube may easily be passed through the tracheal wound, turned at right angles and pushed down the lower section of the trachea. By using a perforated tube in order not to occlude air from

the opposite bronchus, it may be continued for some distance down either bronchus. The bronchi can thus be reached by shorter and wider instruments than by upper bronchoscopy. Although the latter is the ideal method when practical, a previous tracheotomy, emergency, lack of proper instruments, or some unusual complication may make



FIG. 64 —The author's forceps for the extraction of foreign bodies from the bronchi or esophagus.

the lower route preferable. After the trachea has been opened a foreign body in a primary bronchus may be removed with no other instruments than a head-mirror, a female cystoscope and long alligator forceps.

Upper bronchoscopy consists in passing a bronchoscope through the mouth and larynx into the trachea and bronchi. The instruments required are a tube of proper length with appliances for lighting it, a spatula or speculum for depressing the tongue and bringing the larynx into view, sponge holders so made that they will hold the sponge firmly without danger of its coming off, bronchial probes and various

special forceps all long and slender enough to be used through the tube.

The bifurcation in an adult is about fourteen and one-quarter inches from the incisor teeth.

The principal difficulty in passing a bronchoscope is to get it through the glottis. This must be done without any force or danger of injuring the cords. The interior of the larynx is first brought into direct view with a tube spatula or other speculum which presses the tongue and epiglottis out of the

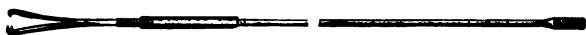


FIG. 65.—The author's sponge holder for the bronchi.

line of vision. When the glottis is distinctly seen, and cocaineized, the end of the bronchoscope is passed through it. It is always necessary to be sure that the tube is in the line of the trachea. It may then be passed to the bifurcation, and either primary bronchus may be entered by taking advantage of the flexibility of the passages. The tube must be a perforated one in order to allow air to enter the other bronchus. By careful manipulation secondary bronchi may be explored. In a normal bronchus there is practically no secretion, but in case of bronchitis from any cause it may be abundant and appear with such rapidity that frequent sponging or suction is necessary.

If it is possible to work without general anesthesia, a certain amount of danger to the patient is avoided. The question should be decided by the condition and bearing of

the patient. The operator should learn to do without it when possible. A general anesthetic is necessary with children. Local anesthetics are dangerous in excess and should be carefully used. They are necessary to abolish reflex cough, and should be applied before instruments are brought in contact with sensitive surfaces, especially the epiglottis, cavity of the larynx, bifurcation of the trachea, and bronchi. A few applications of ten to twenty per cent. solution of cocaine or some similar anesthetic applied with a cotton swab are generally sufficient. A subcutaneous injection of atropine and morphine should be given before general anesthesia, and sometimes when local anesthesia alone is used.

FOREIGN BODIES IN THE LARYNX

Foreign bodies of various shapes are sometimes inhaled into the larynx, and impacted there, or caught in one or both of the ventricular openings. If sufficiently large it may cause fatal asphyxia and urgent symptoms indicate immediate tracheotomy. A smaller body not obstructing respiration is always extremely irritating. Whenever possible the foreign body should be sought by direct laryngoscopy and removed with forceps, care being taken not to push it down into the trachea.

FOREIGN BODIES IN THE TRACHEA

If a foreign body gets through the glottis it is generally inhaled into a bronchus. It may, however, lodge in the trachea, or if it is round and smooth it may be sent back-

ward and forward between the larynx and bronchi by coughing and inspiration. With the help of the direct laryngoscope it may be seized by forceps through the glottis, but it should generally be treated as a foreign body in a bronchus.

FOREIGN BODIES IN THE BRONCHI

A foreign body inhaled into a bronchus is always a serious accident. It may be sooner or later coughed up, but this is often impossible on account of its shape or position. The damage and the symptoms which it causes vary much in different cases. It is sometimes rapidly fatal, in other cases it remains for months or years producing more or less disturbance. It may cause dyspnea, especially if it occludes a bronchial tube, on the other hand there may be no respiratory symptoms from it. It commonly leads to cough and bronchitis, sometimes to serious local sepsis, but the lack of obvious symptoms does not rule out the possibility of its presence.

Diagnosis may be difficult, especially if there is no history of a foreign body having been inhaled. The x-ray is of the greatest assistance in showing the presence and location of inorganic bodies, and will sometimes show the local disturbance about others. In children sudden onset of paroxysmal cough should cause suspicion. By auscultation its position may sometimes be indicated. If the presence of a foreign body is suspected the bronchoscope may be used for diagnosis as well as for treatment.

Treatment.—As a rule, if a foreign body has been inhaled an attempt should be made to remove it. The ideal method is by upper bronchoscopy. A proper equipment of instruments and skill in their use leaves little advantage to lower bronchoscopy. In adults if the foreign body is in the trachea or a primary bronchus and is of such a nature that it may be easily seized by forceps, the operation may be done with local anesthesia. Otherwise the patient should be given a subcutaneous injection of atropin and a general anesthetic, placed on his back on a table with his head extended over the end and supported, the larynx brought into view and cocaineized, and the bronchoscope passed through the larynx and trachea. The bifurcation is easily recognized. The right bronchus is wider and at a less angle with the trachea than the left. Which bronchus should be first explored will often be known beforehand by the *x*-ray or by physical signs. The bronchoscope is passed into the bronchus, and secretion, if present, sponged or sucked away. When the foreign body is seen its position must be studied so that the proper instrument can be chosen for removing it without pushing it farther down or breaking it, or injuring the bronchial walls. Friable objects require special care. The kernel of a peanut, for instance, is an especially dangerous body. It is easily broken, and separate fragments may be easily left behind and set up serious or fatal infection. The greatest care must be taken not to injure or infect the bronchi in operating.

ESOPHAGOSCOPY

The technique of esophagoscopy is very similar to that of bronchoscopy. The tubes are of larger caliber, they are not perforated and they are often provided with a removable stilette which projects as a rounded guard to guide the tube during its passage behind the cricoid.

The position of the patient is the same as for bronchoscopy. By skilful management an esophagoscope can often be passed without an anesthetic, or with nothing more than a little cocaine in the lower pharynx. But a general anesthetic may be necessary in order to enable the operator to work comfortably, especially with tubes of large caliber.

The principal difficulties of esophagoscopy center about the cricoid cartilage and the upper end of the esophagus. This is a common location for stenoses, tumors, and foreign bodies, and it is important that the instrument should not come upon one of these unexpectedly. The passage should be known to be clear before an instrument is passed. Below this point there is seldom any difficulty in examining the whole length of the esophagus by sight in advance of the tube, except in certain pathological conditions.

A long spatula or speculum, especially the open speculum of Mosher, may be carried behind the arytenoids and the upper portion of the cricoid cartilage, and used to press the larynx forward, so as to show the upper margin of the esophagus. If no obstruction is seen the esophagoscope may be passed either through the speculum, or after the speculum is withdrawn, by inserting the fingers to the arytenoids and

guiding the tube through the pyriform sinus on either side. The tube must always be kept in the line of the esophagus and it must be advanced without forcing. Care must always be taken not to injure the mucous membrane over the vertebral column. When the tube has passed the cricoid, the stilette is withdrawn, and its farther passage guided by sight through the tube. During each inspiration the esophagus opens out so that it is possible to see ahead of the tube and to stop before reaching any obstruction.

An esophagoscope with a properly bevelled end may be passed entirely by sight. The bevelled end acts first as a tongue depressor, then as a spatula to raise the cricoid, and finally as part of the esophagoscope.

After the cricoid has been passed, if there is fluid in the esophagus, it must be removed. This may be done by lowering the head of the table so that the fluid runs out by gravity, by pumping it out, or if the amount is small by sponging.

Esophagoscopy is valuable both for diagnosis and treatment. The most frequent conditions calling for its use are foreign bodies, stenoses and tumors.

The cardiac orifice in the adult is about fifteen and three-quarters inches from the incisor teeth.

Foreign bodies lodge most frequently at the upper margin, just below the cricoid. In this position they may often be found with the long spatula and removed with forceps. If not, the esophagoscope must be passed with care, the operator looking ahead through the tube to avoid pushing the body downward. A small tube may easily pass the ob-

ject without its being seen. If the foreign body is sharp or impacted in the walls of the esophagus, special instruments may be required for cutting it before it can be safely removed. If removal is impossible, esophagotomy may be necessary. As the cartilaginous rings of the trachea do not extend to the posterior surface, a foreign body in the esophagus may obstruct respiration by pressure from behind. If this occurs during attempts at removal, it may be necessary to pass a bronchoscope also until the obstruction can be removed.

THE ESOPHAGUS

Esophagismus is a functional disability to swallow solid food, due to a spasm or lack of co-ordination in the lower pharynx or at the introitus to the esophagus at the lower margin of the inferior constrictor muscle. It occurs most commonly in young women. The patient lives on liquids or soft solids and may even have difficulty in swallowing these, so that she becomes anemic and sometimes emaciated. The differential diagnosis between this and a stricture can be made with a bougie or esophagoscope. The trouble can generally be relieved or cured by the passage of bougies.

Strictures may occur in any part of the esophagus from cicatrices or tumors. If the stricture is at the cricoid the patient will have difficulty in swallowing. If lower down, food may be swallowed and either cause a feeling of oppression until it has passed the stricture or it may be regurgitated. The esophagus may become dilated above the

stricture and permanently retain decomposing food. **Diagnosis** can often be made by the x-ray taken immediately after the patient has swallowed bismuth. Esophagoscopy will generally show the character of at least the upper portion of the stricture.

Cicatricial strictures occur especially behind the cricoid, but they occasionally are found in other parts of the esophagus. They are generally due to the swallowing of caustic potash or some other destructive liquid, sometimes to syphilis. A web of tissue may lie across the lumen of the esophagus which after being cut does not return. But more frequently the cicatrices are firm and resistant. They vary much in extent and yield slowly to dilatation. They may be studied with the esophagoscope and treated by careful forcible dilatation, or by the periodic passing of bougies, as large as the lumen of the stricture will allow.

Cardiospasm is an obstruction at the cardiac end of the esophagus. It may be due to a spasm at the cardiac orifice, but more probably to a deflection of the esophagus in connection with its passage through the diaphragm. The symptoms are those of a deep stricture. There may be considerable dilatation of the esophagus above the obstruction. With the esophagoscope, as the cardiac end is approached the lumen of the esophagus is sometimes found to make a sharp turn, generally to the left. Good results are often obtained by dilating the cardiac orifice.

Pouch.—An esophageal pouch or diverticulum may exist opening into the esophagus at its upper end behind the

cricoid. It may cause little trouble for some time, and then suddenly become filled with food and block the entrance to the esophagus. It can generally be found with the esophagoscope. The symptoms may be relieved by finding and dilating the proper opening. It may be permanently removed by external dissection.

Tumors.—The most common tumor is cancer which may originate in the wall of the esophagus, or invade it from the outside. It is generally easily found by the esophagoscope. If it shows an outcropping in the esophagus a piece may be removed for examination, or in some cases enough of the growth may be thus removed to enable food to be swallowed.

CHAPTER XX

THE MOUTH AND TONGUE

THE diseases of the mouth and tongue are not commonly included in text-books of the nose and throat, but as these affections are frequently seen and treated in laryngological clinics, some of the more definite ones are briefly described here.

ACUTE EROSIONS

The mucous membrane of the mouth is lined with stratified pavement epithelium which may become eroded by trauma, by an eruption, or by some constitutional or local infection. When this takes place the erosion often becomes infected by micro-organisms of which the mouth always contains a large variety and number. Fortunately the local resistance to infections is here remarkably good, and the septic process generally remains superficial, but it often obscures the original lesion, especially in acute cases. The abraded surface is covered with a white fibrinous exudate containing different bacteria, and the neighboring mucous membrane is swollen, hyperemic and tender. As these erosions are a symptom of some process which has denuded the epithelium, their character and treatment depend upon their cause. A cleansing mouth wash is

always advisable. In case the erosion is deep or covered with d bris it should be cleaned by wiping it with cotton soaked in a two to eight per cent. solution of nitrate of silver, taking care not to injure the healthy mucous membrane on the margin.

Erosions in the mouth are often called ulcers, but to be consistent with the nomenclature generally used for other mucous membranes, an ulcer should imply a loss of substance deeper than the epithelium.

APHTHÆ

Aphthæ, popularly known as canker, are small circular or oval erosions with a white base and red areola. They are more sensitive and painful than one would expect from their size and appearance. They occur on the edge of the tongue, floor of the mouth, buccal and labial mucous membrane, especially where it joins the gums, and sometimes on the palate. They may be single or multiple, and occasionally confluent. They last for a few days, but may be recurrent. Their etiology has been attributed to herpes, urticaria or local infection, and it is possible that more than one cause may produce them. Herpes is suggested by the local pain, sometimes preceding the eruption, and by their localization. They are sometimes seen to start as vesicles, which soon lose their covering by maceration. Urticaria is suggested by their appearance in some cases in connection with indigestion in persons with an intolerance to certain foods, such as cheese, strawberries and shell fish, although in most cases

no such connection exists. They are said sometimes to be contagious, which suggests an infection, although this also is unusual. In most, if not in all, cases they can best be explained as herpetic. Some persons are especially liable to them and they are rather more common in children than in adults.

Treatment consists in a mouth wash, and touching the erosions with alum or nitrate of silver. Attention to diet and the prohibition of anything which appears to bring on the trouble in the individual case is desirable.

Bednar's aphthæ are superficial erosions occurring on the posterior part of the hard palate and the soft palate of newly born infants. They are probably of traumatic origin.

STOMATITIS

This is an inflammation of the mucous membrane of the mouth, and is so often combined with *gingivitis* or inflammation of the gums that they may be considered together. It may be due to local infection, to carious teeth or to constitutional poisoning.

Acute stomatitis of local origin is probably often caused by a special bacterium although in the luxuriant flora and fauna of the mouth it is impossible to find it. It starts around the teeth and spreads over the gums and the buccal mucous membrane, which become red and sore and in places covered with a pseudo-membrane. There is a deposit of whitish débris between the teeth, salivation and a foul odor. It generally responds readily to treatment. The

mouth should be washed frequently with saturated solution of boric acid, and occasionally with diluted peroxide of hydrogen followed by boric acid. The gums between the teeth should be cleaned carefully with cotton soaked in a two per cent. solution of nitrate of silver or other antiseptic. This should be repeated daily as long as necessary.

Occasionally, especially in children and in persons suffering from some constitutional disease, the virulence of the infection or the lack of resistance prevent proper healing and the stomatitis goes on to ulceration and absorption of the gums, with loosening of the teeth.

The stomatitis of secondary syphilis and Vincent's angina are described under those diseases.

Mercurial stomatitis is a symptom of constitutional poisoning by mercury. It resembles simple acute stomatitis, but is especially marked by tenderness and sometimes looseness of the teeth, and copious salivation. The odor is foul, and there may be ulceration, especially around carious teeth. The essential treatment is to stop the intake of mercury.

Lead-poisoning also shows symptoms in the mouth. A characteristic blue line appears on the margins of the gums surrounding the teeth, but there is seldom much acute inflammation.

Bismuth and arsenic poisoning sometimes cause symptoms in the mouth similar to that of mercury, but less pronounced and severe.

SCURVY

Scorbutus or scurvy is a constitutional disease, due to restricted and tainted food. Although at one time common on ship board and expeditions it is now seldom seen in adults, but occasionally occurs in children. In the mouth the gums become swollen and tender, especially between the teeth, and the mucous membrane shows ecchymoses and bleeds easily. The important treatment is regulation of the diet, fresh vegetables and lime juice.

THRUSH

Thrush is a parasitic disease, caused by the *Oidium albicans*, a fungus which grows on and in the mucous membrane of the mouth sometimes spreading to the pharynx and neighboring cavities. It occurs most frequently in infants, although sometimes seen in children and even adults, especially when suffering from some exhaustive disease, in which case it may become a serious complication. It starts as small, white, adherent patches, which in a few days coalesce, ultimately covering a large part of the mucous membrane with a white, adherent, streaky coating. It is at first painless but as it becomes extensive the pain and discomfort may become considerable. The diagnosis if suspected can be made by the microscope from scrapings. The prognosis, if the patient is otherwise in good health, is good. Virulent cases have been reported in which the disease has penetrated to deeper tissues and vessels, and has formed metastases in other parts of the body. Treat-

ment consists in the application of antiseptics, which must never be irritating and in keeping the mouth as clean as possible.

NOMA

This is a vicious gangrene, spreading rapidly from a focus in the mucous membrane. It occurs generally in young children. It appears as a small, black, hard necrosis, generally on the buccal mucous membrane near the mouth. This spreads rapidly, destroying all tissue as it reaches it, so that in a few days a large part of the face may be involved. It soon breaks down in the center forming large, foul, black sloughs. There is progressive constitutional weakness and general sepsis. The specific cause of the disease has not been determined. In the early stages the fusiform bacillus and spirochete of Vincent have been found, but their connection with the gangrene has not been proved. Unless the spread of the disease can be quickly stopped, the prognosis is fatal. Treatment consists in removing the gangrenous tissue thoroughly, when possible cutting it out with a healthy margin.

If it is curetted this should be followed with the cautery, and in case of recurrence this should be repeated. Salvarsan has been suggested as in the treatment of syphilis, in the hope of killing the unknown cause of the trouble.

PEMPHIGUS

Pemphigus of the mucous membrane occasionally occurs in the mouth, less frequently in the nose, pharynx or larynx.

It is almost always accompanied by pemphigus of the conjunctiva. It may or may not be associated with pemphigus of the skin. Blebs or bullæ appear periodically which soon break, leaving a raw surface and patches of white detached epithelium. The disease is incurable, often leads to blindness and may be fatal, but is generally very chronic. The lesions seem to be often kept in check by arsenic internally.

ACUTE GLOSSITIS

The body of the tongue may become acutely inflamed, painful and so swollen that it fills the mouth and even obstructs the pharynx. Sometimes one-half of the tongue only is affected, in which case it is known as *hemiglossitis*. The cause is often obscure. It is to be distinguished from *Ludwig's angina*, which is a phlegmonous inflammation of the subglottic region.

LEUCOMA

Leucoma is a condition of the epithelium of the tongue and mouth, appearing as whitish patches or areas, varying much in extent and thickness. It may be accompanied by fissures and soreness of the mucous membrane. There are three principal forms to be distinguished from each other, and a transitory form also is sometimes seen which does not come under any of these heads.

Smoker's patch is the result of local irritation. As it is frequently caused by smoking tobacco, especially a pipe; this term may be used to describe this form of leucoma.

The mucous membrane of the hard palate and the tongue, sometimes also of the lips and other parts of the mouth, is covered with areas of white, thickened epithelium. The mouth may become easily inflamed and the mucous membrane swollen, but the symptoms are often very slight. Continued irritation, especially where a pipe chafes the lip, may lead to an epithelioma at this point. If the irritation be discontinued the leucoma slowly disappears.

Syphilitic leucoma is often limited to the dorsum and sides of the tongue. It may be accompanied by thickening of the mucous membrane and sometimes by deep fissures. The tongue is sensitive and sometimes painful. The diagnosis is made by a positive Wasserman reaction, and the process disappears under proper constitutional treatment.

Leukoplakia is a term which is sometimes used to describe all forms of leucoma, but it is best to exclude those which are transitory or have a definite cause. It occurs more frequently on the sides of the tongue; occasionally, or when extensive, on the dorsum and on the buccal mucous membrane. There are commonly several areas, often small, in which the epithelium is whitish and slightly contracted as if the surface had been painted with contractile collodion. These areas may become inflamed and eroded, especially if they are irritated by sharp teeth or in other ways. The disease is more common in men than women. It may come on at any time in adult life and may last for years giving but little trouble except that the tongue is made sore by slight irritation. It may remain stationary, or it may

increase and finally produce swollen and eroded areas, although it is seldom as uncomfortable as syphilitic leucoma. It would in most cases be of little importance were it not for the fact that there is constant danger that some part of it may become epithelioma. For this reason it should be treated seriously, smoking should be prohibited, the teeth should be kept smooth and all irritation prevented. It may be treated by daily application of boracic acid ointment.

GEOGRAPHICAL TONGUE

This curious condition sometimes called *wandering rash* is not uncommon and is often overlooked, but is sometimes taken too seriously from a mistaken diagnosis. It is generally seen in children. It changes from day to day, wandering over the tongue in a design that somewhat suggests a map; hence the names which it has received. It may be more or less extensive but is seldom entirely absent. There appear on the sides of the dorsum of the tongue reddened, smooth areas, often confluent, in which the filiform papillæ seem to have almost disappeared or to have been reduced to minute elevations. These areas are separated from the normal surface by a narrow whitened margin due to a thickening of the papillæ. The areas spread slowly over the surface until a large part of it is involved, but in a few days fade out, so that the surface in whole or in part regains its normal appearance. The etiology has not been settled. It produces no symptoms except that the tongue is more

irritable than normal. After adult life the process may continue as in childhood, or the tongue may become more or less fissured. Treatment does not seem to affect it.

HAIRY TONGUE

This condition, also called **black tongue**, is caused by an elongation and pigmentation of the filiform papillæ over an area in the middle of the dorsum. When extensive it resembles a patch of long, brownish-black fur growing out of the tongue. The etiology has not been definitely determined. The symptoms are slight, and treatment generally unnecessary.

TONGUE-TIE

This is caused by a congenitally short frenum which prevents the tongue from being protruded from the mouth, and restricts its motion both in eating and speaking. If the frenum is simply cut, it generally contracts again during the healing so that it becomes nearly as short as before. Various plastic operations have been devised with varying success.

THE SALIVARY GLANDS

The *parotid gland* lies in front of and below the external ear, surrounding the posterior margin of the ramus of the jaw. It discharges through *Steno's duct* at a point opposite the upper second molar tooth. The *submaxillary gland* lies below and against the lower jaw and partially around the mylohyoid muscle. It discharges through *Wharton's*

duct which passes through the floor of the mouth to a small papilla on the side of the frenum of the tongue.

The *sublingual gland* is under the mucous membrane of the floor of the mouth. It opens by numerous outlets in

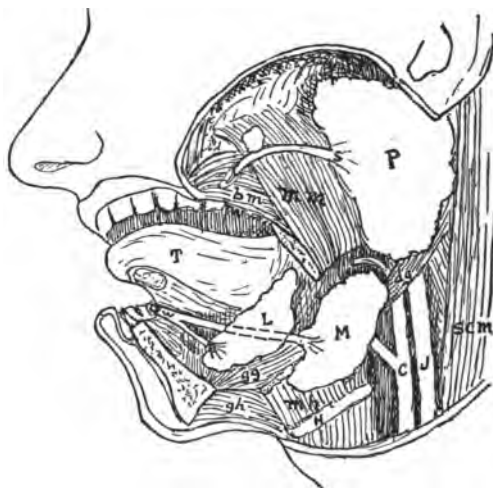


FIG. 66.—The Salivary glands (Heitzmann). *P*, Parotid gland; *M*, Submaxillary gland; *L*, Sublingual gland; *S*, Steno's duct; *W*, Wharton's duct; *B*, Bartholin's duct; *T*, tongue; *J*, internal jugular vein; *C*, carotid artery; *H*, hyoid bone; *mm*, masseter muscle; *bm*, buccinator; *gg*, genioglossus; *gh*, geniohyoid; *mh*, mylohyoid; *scm*, sternocleidomastoid; *dg*, digastric.

the mucous membrane, and also by Bartholin's duct which empties into Wharton's duct.

Mumps is an infectious disease which attacks the parotid gland, possibly occasionally the submaxillary. The incubation period is usually from two to three weeks, but it may be only a few days. It generally begins on one side and it may remain unilateral. The parotid gland becomes swollen

and tender and chewing painful. It lasts for a few days, is highly contagious, and may be followed by orchitis or swelling of the *mammæ*.

Obstruction of Wharton's Duct.—This duct not infrequently becomes temporarily obstructed from acute inflammation extending from a tooth or in other ways. As the patient begins to eat the submaxillary gland begins to swell, until it becomes a painful tumor the size of an egg under the angle of the jaw. This subsides slowly as the saliva leaks out to recur at the next meal. It lasts from one to several days. Permanent obstruction is rare.

Salivary calculus sometimes occurs in Wharton's duct. The symptoms are obstruction to the saliva, and soreness in the floor of the mouth. It may cause suppuration, the pus leaking out with the saliva. If the calculus is large it can be palpated, if small the diagnosis can sometimes be made by the *x*-ray, or with a fine probe introduced into the duct.

Treatment consists in removing it by incision through the floor of the mouth.

A calculus very rarely forms in Steno's duct.

RANULA

Ranula is a cystic collection of a thick mucoid substance in the floor of the mouth, generally on one side of the frenum of the tongue. It forms a bluish-gray soft swelling, with few if any symptoms. Its etiology is not certain. It may be incised and kept open until the cavity is obliterated.

THE TEETH

There are normally twenty temporary or milk teeth and thirty-two permanent teeth. Although they vary in their time of eruption the average age is as follows, the teeth on the lower jaw preceding the corresponding ones on the upper by a varying interval.

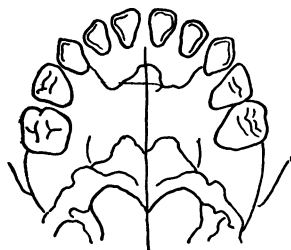


FIG. 67.—The temporary or milk teeth.

TEMPORARY TEETH

2 lower middle incisors,	6- 8 months.
4 upper incisors,	8-10 months.
2 lower lateral incisors,	12 months.
4 canine,	14-20 months.
4 first molars,	12-14 months.
4 second molars,	20-36 months.

PERMANENT TEETH

Middle incisors,	7th year.
Lateral incisors,	8th year.
Canines,	11th year.
First bicuspid,	9th year.
Second bicuspid,	10th year.

- First (or six year) molars, 6th year.
Second (or twelve year) molars, 12th year.
Third molars (or wisdom teeth), 17th-25th year.



FIG. 68.—The permanent teeth.

EPULIS

This is a red, moderately soft tumor which grows from the periosteum between two teeth or from the socket of an extracted tooth. It resembles granulation tissue in appearance, but if not treated it slowly extends along and into the alveolus. Its structure is that of a spindle celled sarcoma, and it must be classed as a mildly malignant growth. It should be entirely removed and the bone thoroughly curetted, and any recurrence immediately treated in the same way. It can generally be eradicated without much difficulty.

CLEFT PALATE

The roof of the mouth is developed laterally, and the two halves unite early in embryonic life to form the hard and

soft palate. This union may fail to take place for a longer or shorter distance at either end. At the posterior end the cleft may extend through the uvula only, resulting in a *bifid uvula*. It may split the soft palate partially or wholly in two, and it may extend into or through the hard palate. In the latter case the lower and posterior parts of the vomer are absent. The vault of the pharynx and the posterior nares may be seen through the cleft. The function of the palate is lost, food regurgitates into the nose, and the palatal sounds in speech are defective. The closing of the cleft by operation is done by freeing as large a flap of mucous membrane as possible from the underlying bone, refreshing the edges of the cleft in the soft palate and suturing the flaps together in the median line. It requires special and careful technique to prevent the wound from tearing apart during healing. Instead of operating, a false palate is sometimes made to fit into the cleft, with a hinged attachment which is moved by the muscles of the soft palate, and opens and shuts the post-nasal space.

Between the two lateral halves of the palate at its anterior end there is inserted in the middle line during early development the premaxilla, which ultimately becomes the anterior part of the upper jaw, carrying the four incisor teeth. The upper lip develops in three parts representing the two lateral halves of the palate and the premaxilla. A cleft, therefore, if anterior, is on one side or occasionally on both sides of the median line, producing a so-called *hare-lip*. If the cleft involves the palate it comes between the incisor

and canine teeth. If it is bilateral the whole premaxilla is dislocated forward. A hare-lip should be operated upon soon after birth. The edges of the cleft or clefts are denuded and brought together with deep sutures or pins, into as good alignment as possible. As a cleft extends into the nose, the deformity includes the alæ as well as the lip. It is sometimes possible to improve the appearance of both by a plastic operation later in life.

CHAPTER XXI

THERAPEUTICS

Applications of different substances may be made to the nose or throat either directly or in the form of a spray, gargle, douche, or insufflation. A probe covered with the substance may be applied directly to the point to be treated, a cotton-stick may be used or pledgets of cotton soaked in a solution laid against the part.

Sprays from some variety of atomizer or nebulizer are of two kinds: in the first the substance in solution is dissolved in water, in the second in oil. If it is desired to bring the medication in contact with the whole mucous membrane, and the passage is not obstructed, a spray is efficient and speedy. If only a localized area is to be treated, especially with an active or poisonous drug, a direct application should be made. Many practitioners use sprays as routine treatment in several different conditions of the mucous membrane, others use them very little. The clinical value of sprays as a method of treatment is, therefore, still a matter of opinion. There are on the market numerous solutions of a mildly antiseptic and aromatic character which are recommended for use by the patient, either as a spray or douche. As a rule, these may be freely used in the throat or mouth, but should not be prescribed for the nasal cavities,

unless the physician has positive reason for advising them. The self-cleansing mechanism of a normal nasal mucous membrane is more likely to be impeded than helped by medications. The physician can often use a spray effectively when the patient may not be able to treat himself in this way.

The following are typical sprays:

R. Sodii Chloridi.....	gr. iv
Aquæ.....	℥i

This normal salt solution is the least irritating of solutions in the nose. It is useful for mechanical irrigation.

R. Seiler's Tablet.....	No. i
Aquæ.....	℥ii

This is mildly alkaline and possibly slightly antiseptic.

R. Argyrol.....	℥i
Aquæ.....	℥i

Often used as an antiseptic in spite of its deep brown color.

R. Menthol.....	
Camphor.....	āā gr. iij
Ol. Pini Sylvest.....	℥. iij
Ol. Petrolei levis.....	℥i

This is an example of an oily spray.

Gargles are used for cleansing and treating the pharynx. The gargle is an old and common method of treatment, and has the advantage of simplicity, provided the patient has learned to do it. It brings solutions into contact with

the mucous membrane for a short time, and mechanically cleans the fauces and mouth. Its results are limited, and it is seldom necessary to insist upon it if it is a trial to the patient. As considerable solution is used each time, a gargle should be prescribed in such a way that a small amount can be mixed with water when needed, as in the form of a tablet. Seiler's tablets have approximately the following composition:

R̄. Sodii Bicarb.	
Sodii Biborat.....	āā 3750 grains
Sodii Benzoat.	
Sodii Salicylat.....	āā 156 grains
Eucalyptol.	
Thymol.....	āā 78 grains
Menthol.....	39 grains
Ol. Gaultheriæ.....	47 drops

To make 1000 tablets. Each tablet to be dissolved in two ounces of water.

Dobell's solution.

R̄. Sodii Biborat.	
Sodii Bicarb.....	āā gr. xx
Phenol.....	gr. viij
Glycerin.....	3ij
Aquæ.....	ad 5viij

These ingredients are used in all formulæ for Dobell's solution, but the proportions vary.

Douches.—A nasal douche is given by pouring a watery solution into one nostril and allowing it to flow through the nasal cavity into the nasopharynx. If the head is held for-

ward it returns by the other nasal cavity, if held backward it goes into the pharynx. The principal objection to nasal douching is that the fluid may find its way into the middle ear or the accessory sinuses and infect them. To guard against the former, the patient should keep his mouth open to prevent swallowing and opening of the Eustachian tube and should not blow his nose until the fluid has entirely drained away. It is useful, especially in chronic atrophic rhinitis, for cleansing the cavities. It should not be used during an attack of acute rhinitis.

A douche may be effectively used instead of a gargle for cleansing the pharynx. The patient takes a deep breath, while he opens his mouth wide, a stream from a syringe is then played directly into the pharynx, until it is necessary to stop to take breath. This can be repeated as often as necessary. If the patient can not hold his tongue away from his palate, a tongue depressor may be necessary. A douche is more effective than a gargle, and is easily learned by most patients. The following is a good prescription for a douche.

℞. Sodii Chloridi,
Sodii Bicarb.,
Sodii Biborat.....āā ʒj

Sig.—To make a wash dissolve a teaspoonful of the powder in a pint of warm water.

Mouth Washes.—Dobell's or Seiler's solution or one of the following may be used as mouth washes:

℞. Acidi Borici.....ʒiijss
Aqua.....ʒviij

This saturated solution can be made by the patient by floating an excess of boric acid powder on the surface of water in a jar, and decanting as required, and filling the jar with water until the powder is exhausted. A good mouth wash for erosions and stomatitis.

R. Tinct. Myrrhæ..... ℥i

Sig.—To make a wash mix a few drops in half a glass of water.

R. Peroxide of Hydrogen.

This may be used in cases of foul odor. It is rather irritating and should be followed by a milder alkaline solution.

Inhalations.—To bring medications in the form of vapor into contact with the mucous membrane, the substances can be volatilized by heat or in a vaporizer. For treating the larynx and trachea a common method is to use steam from boiling water into which has been mixed compound tincture of benzoin or some volatile oil, such as cubebs, pine needle, eucalyptus or sandal wood. An apparatus is sometimes used by which the patient breathes air which has passed through a solution of volatile substances, or which contains a fine cloud of particles from a nebulizer.

Insufflations of fine powders may be made by a simple insufflator by which they are dusted onto the mucous membrane of the nose or larynx. They are less used than formerly.

Lozenges are confections containing medicaments. They are dissolved in the mouth, thus slowly coming in contact with the mucous membrane of the upper digestive tract. They are often useful to allay irritation in the pharynx, and to

stop a cough which is due to it. They should not contain opium or cocaine or substances likely to upset the stomach. As the physician is generally dependent upon those in the market he should carefully consider the ingredients before prescribing them.

Ointments are useful in the treatment of the nasal vestibule. A good ointment for general purposes may be made as follows:

℞. Acidi Borici..... grs. xxx
 Ung Aquæ Rosæ..... ʒiv
 M., Ft. Ung.

A diluted citrine ointment is often used for its germicidal qualities, but it is sometimes too irritating.

℞. Ung. Hydrarg. Nitratis,
 Ung. Simp..... āā ʒii
 M., Ft. Ung.

Caustics should be restricted to the spot where they are needed, because any neighboring healthy mucous membrane which is unnecessarily cauterized will be injured, perhaps seriously. Caustics should never be used on the cartilaginous septum for the purpose of stimulating the process of healing, as they invariably do the reverse. They are useful there only to destroy an offending artery or angioma. They should never be used in the upper regions of the nose.

The *galvanocautery* is often useful to destroy small areas of tissue which are difficult to remove surgically. It may also be used to reinforce less active cauterizing agents.

Chromic acid fused on a probe or in saturated solution produces an eschar which penetrates the epithelium, but seldom destroys the deeper layers of the mucous membrane. Care must be taken that it does not run beyond the field in which it is needed. When used in the nose it must never be allowed to reach both a turbinate and the septum opposite to it, as there is danger that an adhesion will be formed at this point. A ten per cent. solution may be used in the mouth and pharynx as an application to condylomatous mucous membrane.

Trichloroacetic acid is much less penetrating than chromic acid. Applied in saturated solution it forms a white coagulation of the surface of the epithelium, which disappears in a few hours. It may be used for very superficial cauterization.

COCAINE

The hydrochloride of cocaine is commonly used for local anesthesia. As it is an active poison and also a habit-forming drug it must always be applied with care by the physician and should never be prescribed for the patient. The mucous membrane of the nasal cavities is generally easily made anesthetic by applying a solution of cocaine to it. Cocaine also shrinks the erectile tissue of the turbinates, thus aiding examination. A small quantity of one per cent. solution of cocaine sprayed into the nose with an atomizer is generally sufficient to shrink the turbinates and to allow probing or even the removal of polypi. Stronger solutions should not

be used in a spray, as the drug is easily absorbed, and may cause symptoms of poisoning. Solutions of five, ten or even twenty per cent. may be applied to as much of the mucous membrane as is necessary by inserting pledgets of cotton soaked in the solution and allowing them to remain for a few minutes, or by dipping a cotton stick in the solution and rubbing it over the part a few times at intervals of a minute. In the pharynx it is harder to get the effects of cocaine on account of the thickness of the epithelium and because it runs down or is swallowed. Cotton holding the solution may be held against the part with an applicator. For deep penetration, as in operating on the tonsil, a sub-mucous injection of a weak solution is necessary. To cocaineize the larynx, a spray should first be used, followed by direct application with cotton on an applicator of a ten or twenty per cent. solution. The addition of a small amount of adrenalin increases the duration of cocaine anesthesia.

Cocaine Poisoning.—There is a great difference in the susceptibility to cocaine of different persons. Children are especially susceptible. Until a patient's tolerance has been determined small amounts should be used, especially in the nose, where absorption is rapid. The amount and strength of the different solutions should be so regulated that the total possible absorption does not exceed from one-half to one grain. Patients are for some reason especially liable to faint during intranasal operations, even without cocaine, and this tendency is increased by cocaine. In a simple fainting attack the pallor, apprehension and, when it occurs, the

loss of consciousness, follow proportionately the weakness and disappearance of the pulse, and these soon disappear in the horizontal position and with stimulation. In acute cocaine poisoning the symptoms are less transitory, the pulse remains rapid, the respiratory distress is more marked, and there is at first nervous excitement followed by apprehension, confusion and sometimes delirium. In serious cases the most common danger is respiratory paralysis, although sometimes the heart is the first to give out. Treatment consists in the horizontal position, and according to indications, stimulants, sedatives, and artificial respiration. For slight symptoms half a drachm of aromatic spirits of ammonia in water, or the inhalation of a few whiffs of ether are useful.

Substitutes for Cocaine.—Different substances are often used instead of cocaine, and are especially useful for patients with an intolerance to the latter.

Novocaine is probably the best substitute for cocaine. It is used in solutions of the same strength and is less poisonous.

Eucaine is less acutely poisonous than cocaine although it is not free from the danger of habit forming. There are different varieties of which the best are beta-eucaine and the lactate. The solutions must be stronger than cocaine, as the anesthesia and contracting of the turbinates is less.

Alypin in ten per cent. solution will often give satisfactory anesthesia without contracting the turbinates.

Stovaine does not appear to have proved itself always non-toxic nor to have replaced other drugs in practice.

ADRENALIN

Adrenalin, although a trade name, is often used as a type of the solutions of extract of the suprarenal gland. Its normal strength is 1-1000, but this may be diluted up to ten times its bulk in salt solution, or added to solutions of cocaine. It should be discarded if old or contaminated. It is a powerful vasoconstrictor. When applied to mucous membranes it produces intense pallor and it contracts the turbinates. It is of the greatest value in preventing bleeding during operations especially in the nasal cavities. After its effects have passed off bleeding may occur, and this possibility must be borne in mind by the surgeon. It may be applied to the surface in the same manner as cocaine, or the two solutions may be mixed in the proportion of one part adrenalin solution to five parts of a ten per cent. cocaine solution.

Adrenalin is also used to stop hemorrhage, but it cannot always be relied upon because if the bleeding comes from an artery it may not be sufficient to occlude it.

Adrenalin has been recommended in the form of a spray or mixed with an ointment to stop the paroxysms of hay fever. This it does in some cases, but in others it produces a temporary rhinitis which is more uncomfortable than the original trouble.

Nitrate of silver has long been used for local treatment of the throat. In solid form it is a caustic. Dissolved in water its activity varies with the strength of the solution. A strong solution of eight per cent. or over coagulates the

superficial epithelium and may produce an erosion. It is useful for cleaning septic areas or as an application to aphthous patches. Weaker solutions, from one to eight per cent., may be used as a germicide in septic tonsillar crypts or ulcers, such as Vincent's angina. It should never be applied so freely that it may drop into the larynx or be swallowed. It may be used in the nasopharynx but seldom in the nasal cavities.

INDEX

- ABDUCTION** of the vocal cords, 285
Abductor paralysis, 285, 286
Abel's bacillus, 107
Abscess of septum, 70
 peritonsillar, 190
 retropharyngeal, 223
Accessory sinuses, anatomy of, 42
 diseases of, 137
 mucocoele of, 159
 ostia of, 44
 physiology of, 51
 tumors of, 157
 thyroid gland, 226, 303
Acid, boric, 342, 344
 chronic, 345
 trichloracetic, 345
Actinomycosis, 248
Adduction of vocal cords, 285
Adenoids, 174
 effect on dental arch, 176
 on speech, 294
 examination for, 177
 facies in, 176
 operation for, 179
 symptoms of, 176
Adhesions, nasal, 71
Adrenalin, 348
Alæ, cartilage of, 36
 collapse of, 66
 nasi, 37
Alcohol injection in laryngeal
 tuberculosis, 277
Alypin, 347
Anaphylaxis, 115, 121
 from horse serum, 117, 232
Aneurism of the aorta and recur-
 rent paralysis, 287
Angina, Ludwig's, 220
 Vincent's, 219
Angioma of pharynx, 226
 of septum, 157
Anosmia, 126
Antitoxin, diphtheria, 229, 231
 Dunbar's, for hay fever, 115
 in horse asthma, 117, 232
 urticaria from, 232
Antrum of Highmore, anatomy
 of, 45
 acute inflammation of, 139
 carcinoma of, 160
 empyema of, 140
 hydrops of, 127
 intranasal operations on, 143
 ostium of, 45
 transillumination of, 25
 washing, 141
 x-ray of, 140
Aorta, aneurism of, and recurrent
 paralysis, 287
Aphonia, 293
 from papilloma, 297
 hysterical, 289
Aphthæ, 324
 Bednar's, 325
Aphthous stomatitis, 324
Area, Kiesselbach's, 86
Argyrol, 340
Arsenic poisoning, 326
Arthritis from tonsils, 198
Aryepiglottic folds, 21, 252
Arytenoid cartilages, 251
 club-shaped, 273
Arytenoideus muscle, 256, 284
Asch operation for deflected
 septum, 84
Asthma, horse, 114, 116
 nasal, 121
Atrophic laryngitis, 269
 rhinitis, 106
Autoscope, Kirstein's, 12
Autumnal catarrh, 116

BACILLUS, Abel's, 107
 Friedländer, in scleroma, 247

- Bacillus, fusiform, 219
 Klebs-Löffler, 228
 lepra, 246
 mallei, 234
 Bacteria in tonsillar crypts, 172, 198
 Ballenger's ethmoid labyrinth operation, 154
 incision in peritonsillar abscess, 194
 Bartholin's duct, 333
 Bednar's aphthæ, 325
 Benzoin, compound tincture of, 343
 Blind uvula, 216, 337
 Bifurcation of trachea, 314
 Bismuth poisoning, 326
 Black tongue, 332
 Bone in tonsils, 208
 Boric acid, 342, 344
 Breathing, obstruction to, 33
 Bronchi, foreign bodies in, 316
 Bronchial secretion, 30
 Bronchoscopy, 312
 instruments for, 311, 313
 Brünning's instruments for bronchoscopy, 311
 Bulla ethmoidalis, 41
 Bullous middle turbinate, 158
 Bursa, pharyngeal, 166

 CADAVERIC position, 288
 Calculi of tonsils, 208
 salivary, 334
 Caldwell-Luc operation for empyema of antrum, 145
 Cancer of larynx, 303
 syphilis, and tuberculosis, differential diagnosis, 236
 Canine fossa, operation through, 144
 Canker of mouth, 324
 Capsule of tonsil, 182
 Carcinoma of antrum, 160
 of pharynx, 227
 Cardiac orifice, 319
 Cardiospasm, 321
 Cartilage, alar, 36
 arytenoid, 251
 cricoid, 251
 lateral, of nose, 36
 nasal septal, 38
 Cartilage of epiglottis, 252
 of Santorini, 252
 of Wrisberg, 252
 thyroid, 250
 Catarrh, autumnal, 116
 nasal, 100
 post-nasal, 29
 Caudal extension, 38, 76
 Caustics, 344
 Cerebrospinal rhinorrhea, 127
 Chancre, 237
 of tonsils, 220
 Chickenpox, 234
 Choana, 19, 40
 occlusion of, by plate of bone, 167
 Chorea, cough in, 33
 from tonsils, 198
 Chromic acid, 345
 Citrine ointment, 344
 Cleft palate, 336
 Clergyman's sore throat, 214
 Clinical history, 28
 Club-shaped arytenoids, 273
 Cocaine, 345
 poisoning, 346
 substitutes for, 347
 Cockscomb infiltration of larynx, 273
 Colds, 92
 Collapse of alæ, 66
 Compressor sacculi laryngis muscle, 254
 Condyloma of larynx, 271
 syphilitic, 239, 243
 Congenital laryngeal stridor, 282
 Contacts, nasal, 124
 Cords. See also *Vocal cords*.
 Coryza, reflex, 124
 vasomotor, 118
 Cough, 32
 laryngeal, 262
 Cricoarytenoid muscles, lateral, 256, 285
 posterior, 256, 285
 Cricoid cartilage, 251
 in esophagoscopy, 318
 Cricothyroid muscles, 255, 284
 Croup, 263
 dyspnea from, 265
 Crypts of tonsils, 182
 Cyst, dentigerous, 157

- Cyst of pharynx, 226
thyroglossal, 302
Czermak's head-mirror, 11
- DEFECTS in speech, 291, 293
Deformities of nose, 59
of palate, 293
Dental arch, effects of adenoids
on, 176
widening of, 136
Dentigerous cyst, 157
Deviations of septum, 72
Diphtheria, 228
antitoxin, 229, 231
bacillus carriers, 232
dyspnea from, 31, 230
intubation in, 230
tracheotomy in, 230
Direct intubation, 307
laryngoscopy, 20
Dislocation of nasal bones, 54
Dobell's solution, 341
Douches, 341
Duct, Bartholin's, 333
nasofrontal, 42, 45
Steno's, 332
Wharton's, 332
Dunbar's antitoxin for hay fever,
115
Dysmenorrhea, nasal treatment
of, 123, 125
Dysphagia from cancer of larynx,
203
from peritonsillar abscess, 192
from strictures of esophagus,
320
from superior laryngeal nerve,
284
from tuberculosis of larynx, 276
Dyspnea, 33
from abductor paralysis, 286
from cancer of the larynx, 303
from croup, 265
from diphtheria, 31, 230
from edema of the larynx, 266
from foreign bodies, 316
from papilloma, 297
from spasm of the glottis, 288
from stenosis of larynx, 278
- ECZEMA of nasal vestibule, 64
Edema of larynx, 266
- Empyema of antrum, 140
of frontal sinus, 147
of sphenoidal sinus, 155
Enlarged tonsils, 183, 194
Epiglottis, 21, 252
cartilage of, 252
in laryngeal stridor, 283
tuberculosis of, 274
Epilepsy, laryngeal, 289
Epistaxis, 86
Epithelioma of tongue, 331
Epulis, 336
Erectile tissue of turbinates, 42
Erosions of the mouth, 323
Eruption of chickenpox, 234
of herpes, 217
of measles, 233
of scarlet fever, 233
Erysipelas of nose, 65
Esophagismus, 320
Esophagoscopy, 318
Esophagus, diseases of, 320
foreign bodies in, 319
pouch of, 321
stricture of, 320
tumors of, 322
Ethmoid bone, perpendicular
plate of, 38, 76
cells, 46
diseases of, 151
operations upon, 154
x-ray of, 152
Ethmoiditis, 151
Eucaïne, 347
European hay-fever, 116
Eustachian tubes, orifices of, 19
prominence of, 165
Examination, instruments for, 14
- FACIES, adenoid, 176
Fainting, 346
False vocal cords, 21, 253
Falsetto speech, 293
Fauces, examination of, 15
herpes of, 217
pillars of, 115
Faucial tonsils, 180
Fibroma of nasopharynx, 161
of pharynx, 226
of vocal cords, 295
Follicular pharyngitis, 214
Foramen cecum of tongue, 302

- Foreign bodies, dyspnea from, 316
 in bronchi, 316
 in esophagus, 319
 in larynx, 315
 in nose, 134
 in tonsils, 208
 in trachea, 315
 Fossa, canine, operation through, 144
 of Rosenmüller, 165
 supratonsillar, 180
 Fracture of nasal bones, 53
 Fränkel on tonsillitis after operation, 186
 Friedländer's bacillus in scleroma, 247
 Frontal sinus, anatomy of, 145
 diseases of, 145
 empyema of, 147
 external operation, 149
 intranasal operation, 148
 transillumination of, 26
 x-ray of, 27, 148
 Fronto-ethmoidal cells, 47
 Fungus, ray, 248
 Furunculosis of nasal vestibule, 64
 Fusiform bacillus, 219
- GALVANOCAUTERY, 103, 344
 Garcia, Manuel, laryngoscope of, 11
 Gargles, 340
 Geographical tongue, 331
 Giant cell, 243
 Gingivitis, 325
 Glanders, 234
 Gleason operation for deflected septum, 85
 Glossitis, acute, 329
 Glottis, 21, 253
 innervation of, 285
 spasm of, 265, 288
 Granular pharyngitis, 214
 Guillotine, 204
 Gumma, 239
 of pharynx, 221
- HAIRY tongue, 332
 Hard palate, arch of, 136, 176
 Hare-lip, 337
- Hay-fever, 113
 Dunbar's antitoxin for, 115
 European, 116
 symptoms, of, 118
 Head-mirror, 12
 Hemiglossitis, 329
 Hemorrhage after tonsillectomy, 204
 Herpes of fauces, 217
 of mouth, 324
 Hiatus semilunaris, 42
 Hippocrates on nasal fracture, 58
 Hoarseness, 32, 262, 293, 303
 Horse asthma, 114, 116
 danger of antitoxin in, 117
 232
 serum, anaphylaxis from, 117, 132
 Hydrops of antrum, 127
 Hydrorrhea, nasal, 127
 Hyperesthetic rhinitis, 114
 Hypertrophic rhinitis, 101
 Hypertrophy of tonsil, 183, 194
 lingual, 209
 of turbinates, 102
 posterior end, 105
 Hypopharynx, 168
 Hysterical aphonia, 289
- ILLUMINATION, 12
 Impediment in speech, 291, 292
 Infection from tonsils, 198
 Influenza, 96
 Infundibulum, 42
 Inhalations, 343
 Instruments for examination, 14
 Insufflations, 343
 Intranasal operations on antrum, 143
 Intubation, 306
 direct, 307
 in diphtheria, 230
 Iodide of potassium in syphilis, 241
 Isthmus of thyroid gland, 308
- JACKSON'S instruments for bronchoscopy, 311
 tube spatula, 23
- KERATOSIS tonsillar, 206
 Kiesselbach's area, 86

- Killian's frontal sinus operation, 149
 instruments for bronchoscopy, 311
 laryngoscope, 12
 suspension laryngoscopy, 24
 tube spatula, 23
 Kirstein's autoscope, 12
 Klebs-Löffler bacillus, 228
 Koplik's spots, 233
 Krieg's submucous resection for deflected septum, 81

 LARYNGEAL cough, 262
 epilepsy, 289
 stridor, 282
 vertigo, 289
 Laryngismus stridulus, 265
 Laryngitis, acute, 261
 chronic, 268
 atrophic, 269
 subglottic, 263
 Laryngology, history of, 11
 Laryngoscope, Killian's, 12
 Laryngoscopy, direct, 22
 indirect, 20
 mirror for, 14, 20
 suspension, 24
 Larynx, anatomy of, 250
 blood supply of, 254
 cancer of, 303
 cockscomb infiltration of, 273
 condyloma of, 271
 congenital stridor of, 282
 edema of, 266
 examination of, 20
 foreign bodies in, 315
 indirect operation, 300
 in locomotor ataxia, 286
 lupus of, 277
 motor paralyses of, 285
 mucous membrane of, 254
 muscles of, 254
 nerves of, 256, 284
 neuromes of, 284
 papilloma of, 296
 cocaine anesthesia for removal of, 300
 direct operation for, 301
 indirect operation for, 300
 perichondritis of, 270
 physiology of, 258
 Larynx, sensory disturbances of, 284
 stenosis of, 277
 syphilis of, 270
 tuberculosis of, 271
 tumors of, 295
 ventricles of, 254
 Lead poisoning, 326
 Leprosy, 246
 Leptothrix buccalis, 205
 Leucoma, 329
 Leukoplakia, 330
 Lingual tonsil, 208
 hypertrophy of, 209
 Lipoma of pharynx, 226
 Lips in speech, 294
 Locomotor ataxia, larynx in, 286
 Loss of voice, 289
 Lozenges, 343
 Ludwig's angina, 220
 Lupus, 244
 of larynx, 277
 of nose, 65, 112
 of pharynx, 223
 treatment of, 245
 Luschka's tonsil, 174

 MAXILLA, nasal crest of, 39
 process of, 36, 54
 Maxillary sinus, 45, 139
 sinusitis, 139
 Measles, 233
 Meatus, inferior middle and superior, 17, 40, 49
 Membrane in diphtheria, 228
 in pharynx, 216, 218
 in scarlet fever, 233
 in tonsillitis, 188
 in Vincent's angina, 219
 Mercurial stomatitis, 326
 Mercury in syphilis, 241
 Middle turbinate, removal of, 153
 Milk teeth, 335
 Mirror, head, 12
 laryngoscopic, 14, 20
 rhinoscopic, 14, 18
 Morgagni, ventricles of, 254
 Mosher's ethmoid operation, 155
 spatula, 23
 Mouth, actinomycosis of, 248
 canker of, 324
 erosions of, 323

- Mouth, herpes of, 324
 pemphigus of, 328
 scurvy of, 327
 thrush of, 327
 washes, 342
 Mucocoele, 159
 Mucous patches, 221, 237
 local treatment of, 242
 Mumps, 333
 Muscle, arytenoid, 256, 284
 compressor sacculi laryngis, 254
 palatoglossus, 16, 166
 palatopharyngeus, 16, 166
 Muscles, cricoarytenoid, lateral,
 256, 285
 posterior, 256, 285
 cricothyroid, 255, 284
 of larynx, 254

 NANSEN on colds, 95
 Narrow nasal cavities, 135
 Nasal adhesions 71
 asthma, 121
 bones, 35, 53
 dislocation of, 54
 fracture of, 53
 catarrh, 100
 cavities, 39
 narrow, 135
 tumors of, 157
 contacts, 124
 neuroses, 123
 obstruction, 31
 process of maxilla, 36, 54
 rhinorrhea, 127
 secretion, 31
 septum. See also *Septum, nasal*.
 speculum, 17
 spine, 39
 treatment of dysmenorrhea,
 123, 125
 vestibule, 37
 Nasoantral wall, 41
 Nasofrontal duct, 42, 45
 Nasopharyngitis, acute, 210
 chronic, 210
 Nasopharynx, abnormalities of,
 166
 anatomy of, 165
 diseases of, 210
 fibroma of, 161
 polypus of, 132, 161

 Nerves of larynx, 256, 284
 olfactory, 42
 Neuralgia, sphenopalatine, 125
 Neuritis of superior laryngeal
 nerve, 284
 Neuroses, nasal, 123
 of larynx, 284
 Nitrate of silver, 348
 Nodes, singer's, 279
 Noma, 328
 Normal salt solution, 340
 Nose, anatomy of, 35
 deformities of, 59
 erysipelas of, 65
 foreign bodies in, 134
 fracture of, 53
 lateral cartilage of, 36
 leprosy of, 246
 lupus of, 65
 packing of, 88
 physiology of, 47
 polypi in, 128
 saddle-back, 62
 scleroma of, 247
 septal cartilage of, 38
 syphilis of, 110
 tuberculosis of, 112
 Nostrils, 37, 66
 Novocaine, 347

 OBSTRUCTION, nasal, 31
 to breathing, 33
 O'Dwyer intubation instruments,
 306
 Oldium albicans, 327
 Ointments, 344
 Olfactory nerves, 42
 Oropharynx, 16, 168
 Os planum, 46
 Ostia of accessory sinuses, 44
 Ostium maxillare, 141
 Ozena, 106

 PACHYDERMIA laryngis, 281
 Pain, 34
 Palate, cleft, 336
 defects of, 293
 hard, arch of, 136, 176
 paralysis of, 230
 soft, anatomy of, 167
 Palatoglossus muscle, 16, 166
 Palatopharyngeus muscle, 16, 166

- Papilloma, aphonia from, 297
 dyspnea from, 297
 of larynx in adults, 300
 in children, 296
 of pharynx, 225
 of uvula, 225
 tracheotomy for, 298
 Paraffin, injection of, in atrophic rhinitis, 110
 in saddle-back nose, 63
 Paralysis, abductor, 285, 286
 following diphtheria, 230
 motor, of larynx, 285
 of palate, 230
 of recurrent laryngeal nerve, 257
 recurrent, and aneurism of aorta, 287
 Parotid gland, 332
 Parotiditis, 333
 Paroxysmal sneezing, 114
 Patches, mucous, 22, 237
 Peanut in bronchus, 317
 Pediculi capitis, 64
 Pemphigus, 328
 Perforation of septum, 69
 Perichondritis of larynx, 270
 Peritonsillar abscess, 190
 Ballenger's incision in, 190
 Perpendicular plate of the ethmoid, 38, 76
 Pharyngeal bursa, 166
 tonsil, 174
 Pharyngitis, acute, 211
 chronic, 213
 follicular, 214
 granular, 214
 membranous, 218
 sicca, 214
 Pharyngomycosis, 206
 Pharynx, acute erosions of, 216
 anatomy of, 165
 angioma of, 226
 carcinoma of, 227
 cicatricial contractions of, 222
 cyst of, 226
 diseases of, 210
 fibroma of, 226
 gumma of, 221
 lipoma of, 226
 lupus of, 223
 membrane of, 216, 218
 pharynx, papilloma of, 225
 sarcoma of, 227
 scleroma of, 247
 syphilis of, 220
 tuberculosis of, 222
 tumors of, 225
 vault of, 19
 phthisis laryngis, 271
 pillars of fauces, 15
 plica tonsillaris, 182
 vestibuli, 38
 Pliny on colds, 97
 Poisoning, arsenic, 326
 bismuth, 326
 cocaine, 346
 lead, 326
 Pollantin, 120
 Pollen, 116
 Polypus, nasal, 128
 etiology of, 129
 removal of, 132
 nasopharyngeal, 132, 161
 of vocal cords, 295
 Posticuslaemung, 286
 Post-nasal catarrh, 29
 packing, 89
 space, 19, 165
 Pouch of esophagus, 321
 Premaxilla, 39, 337
 Profile, 35
 Pyriform sinus, 21, 168

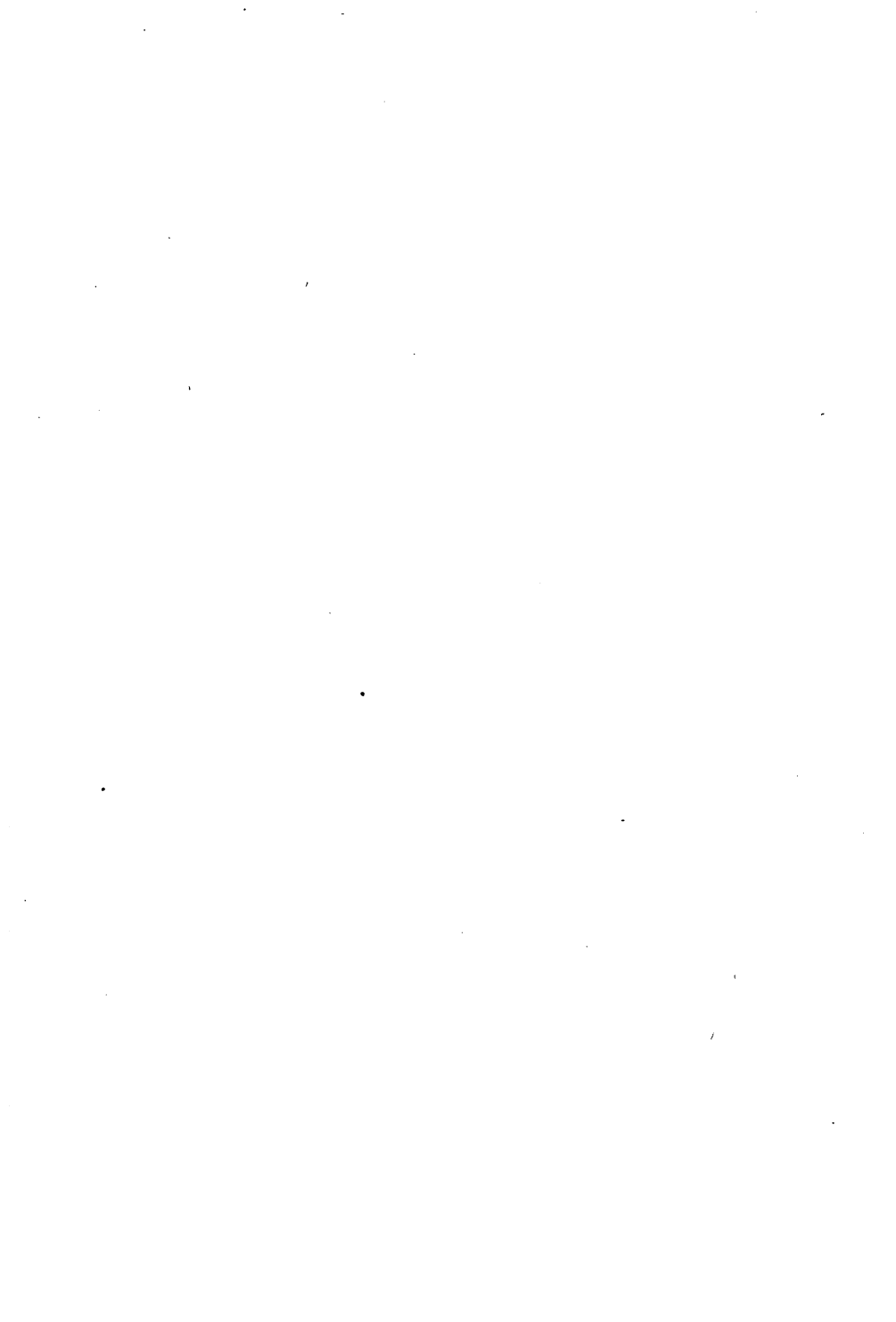
 QUINSY, 190

 RAGWEED in hay-fever, 116
 Ranula, 334
 Rash, wandering, 331
 Ray fungus, 248
 Reaction, Wassermann, 240
 Reflex coryza, 124
 Recurrent laryngeal nerve, 257
 paralysis of, 285, 287
 Respiration, 49
 Retropharyngeal abscess, 223
 gland, enlarged, 224
 tuberculosis, 224
 Rheumatism from tonsils, 198
 Rhinitis, acute, 91
 atrophic, 106
 catarrhal, 100
 chronic, 99
 hyperesthetic, 114

- Rhinitis, hypertrophic, 101
 of measles, 233
 vasomotor, 113
 Rhinolith, 135
 Rhinorrhea, 127
 Rhinoscleroma, 247
 Rhinoscopy, anterior, 16
 mirror for, 14, 18
 posterior, 18
 Ring of Waldeyer, 170
 tonsillar, 170
 Rose cold, 114, 116
 Rosenmüller fossa of, 165
 Roux and Yersin's work in diphtheria, 229
- SADDLE-BACK deformity of nose, 62
- Salivary calculus, 334
 glands, 332
 Salt solution, normal, 340
 Salvarsan, 241
 Santorini, cartilages of, 252
 Sarcoma of nasal cavities, 160
 of pharynx, 227
 of tonsils, 227
 spindle-celled, 336
 Scarlet fever, 233
 Scleroma, 247
 Friedländer's bacillus in, 247
 Scorbutus, 327
 Scurvy, 327
 Secretion, nasal, 31
 tonsillar, 196
 unilateral, 31
 Seiler's tablet, 341
 Semon's law, 285
 Sense of smell, 48, 51, 126
 of taste, 51, 126
 Sensory disturbances of larynx, 284
 Septum, nasal, abscess of, 70
 adhesions of, 71
 anatomy of, 38
 angioma of, 157
 cartilage of, 38
 deviations of, 72
 adjustment of turbinates to, 76
 erosions of, 68
 leprosy of, 246
 perforation of, 69
 Septum, spurs of, 39, 75
 ulceration of, 71
 Silver nitrate, 348
 Singer's nodes, 279
 Singing voice, 259
 Sinus, frontal, 45. See also *Frontal Sinus*.
 maxillary, 45, 139. *Antrum of Highmore*.
 pyriform, 21, 168
 sphenoidal, 47. See also *Sphenoidal sinus*.
 Sinuses, accessory, 42. See also *Accessory sinuses*.
 Sinusitis, acute, 137
 frontal, 145
 maxillary, 139
 sphenoidal, 155
 chronic, 138
 frontal, 147
 maxillary, 140
 sphenoidal, 155
 of ethmoid cells, 151
 Sluder on sphenopalatine neuralgia, 125
 tonsillectomy of, 204
 Smell, sense of, 48, 51, 126
 Smoker's patch, 329
 Sneezing, paroxysmal, 114
 Soft palate, 167
 Spasm of glottis, 265, 288
 Spatula, Killian's tube, 23
 Speculum, nasal, 17
 Speech, 259
 center, 291
 defects in, 291, 293
 effect of adenoids on, 294
 falsetto, 293
 lips in, 294
 tongue in, 294
 Sphenoidal sinus, anatomy of, 47
 diseases of, 155
 operation upon, 156
 ostium of, 47
 Sphenopalatine neuralgia, 125
 Spindle-celled sarcoma, 336
 Spine, nasal, 39
 Spirochæta pallida, 240
 Sponge holder, 314
 Spots, Koplik's, 233
 Sprays, 339
 cocaine, 345

- Spurs of septum, 39, 75
- Stammering, 291, 293
- Steno's duct, 332
- Stenosis of larynx, 277
- Stomatitis, acute, 325
 - aphthous, 324
 - herpetic, 324
 - mercurial, 326
- Stovaine, 347
- Strawberry tongue, 233
- Stricture of esophagus, 320
- Stridor, laryngeal, 282
- Styloid process, elongated, 208
- Subglottic laryngitis, 263
- Sublingual gland, 333
- Submaxillary gland, 332
- Submerged tonsil, 180, 184
- Submucous resection, 81
- Superior laryngeal nerve, 256, 284
 - injection with alcohol, 277
- Supratonsillar fossa, 180
- Suspension laryngoscope, 24
- Syphilis, 237
 - condyloma of, 230, 243
 - iodide of potassium in, 241
 - late, 238
 - mercury in, 241
 - of larynx, 270
 - of nose, 110
 - of pharynx, 220
 - of tonsils, 221
 - tuberculosis and cancer, differential diagnosis, 236
- Swallowing, 169
- TASTE, sense of, 51, 126
- Teeth, 335
- Test, Wassermann, 240
- Throat, clergyman's sore, 214
- Thrush, 327
- Thyroglossal cyst, 302
- Thyroid cartilage, 250
 - gland, accessory, 226, 303
 - isthmus of, 308
 - tumor of tongue, 226, 303
- Thyrotomy, 304
- Tincture of benzoin, compound, 343
- Tone production, 259
- Tongue, black, 332
 - depressor, 15
 - diseases of, 329
- Tongue, epithelioma of, 331
 - foramen cecum of, 302
 - geographical, 331
 - hairy, 332
 - in speech, 294
 - leucoma of, 329
 - leukoplakia of, 330
 - strawberry, 233
 - thyroid tumor of, 226, 303
 - tie, 332
 - wandering rash of, 331
- Tonsil, capsule of, 182
 - lingual, 208
 - Luschka's, 174
 - pharyngeal, 174
 - submerged, 180, 184
- Tonsillar infection, 198
 - ring, anatomy of, 170
 - development of, 172
 - physiology of, 172
 - secretion, 196
- Tonsillectomy, 201
 - hemorrhage after, 204
- Tonsillitis, acute, 185
 - chronic, 197
 - subacute, 189
- Tonsils, arthritis from, 198
 - enlarged, 183, 194
 - faucial, 180
 - bone in, 208
 - calculi of, 182
 - capsule of, 182
 - chancre of, 220
 - chorea from, 198
 - crypts of, 182
 - development of, 172, 180, 183
 - foreign bodies in, 208
 - hypertrophy of, 183, 194
 - infection from, 198
 - in scarlet fever, 233
 - keratosis of, 206
 - reasons for removal of, 200
 - retained secretions in, 196
 - rheumatism from, 198
 - sarcoma, of, 227
 - syphilis of, 221
 - tuberculosis of, 198, 243
- Trachea, bifurcation of, 314
 - examination of, 22
 - foreign bodies in, 315
 - inflammation of, 262
- Tracheotomy, 308

- Tracheotomy for papilloma, 298
 in diphtheria, 230
 tube, replacing of, 310
 Transillumination of antrum, 25
 of frontal sinus, 26
 Trichloroacetic acid, 345
 Tuberculosis, 243
 of epiglottis, 274
 of larynx, 271
 of nose, 112
 of pharynx, 222
 of tonsils, 198, 243
 retropharyngeal, 224
 syphilis and cancer, differential
 diagnosis, 236
 treatment of local, 243, 245
 Tumors of accessory sinuses, 157
 of larynx, 295
 of nasal accessory cavities, 157
 Turbinate, bullous middle, 158
 hypertrophy of posterior end
 of, 105
 removal of middle, 153
 Turbinates, 17, 42
 adjustment to deviating sep-
 tum, 76
 erectile tissue of, 42
 hypertrophy of, 102
 Turbinotomy, 104
 Türck starts first laryngologic
 clinic, 11
 ULCERATION, chronic, 235
 in actinomycosis, 248
 of leprosy, 246
 Uncinate process, 42
 Unilateral secretions, 31
 Urticaria from antitoxin, 232
 Uvula, anatomy of, 167
 bifid, 216, 337
 enlongation of, 214
 papilloma of, 225
 VACCINES, 64, 99, 101
 Varicella, 234
 Vasomotor coryza, 118
 rhinitis, 113
 Vault of pharynx, 19
 Ventricles of larynx, 254
 Ventricular bands, 20, 253
 Vertigo, laryngeal, 289
 Vestibule, nasal, 37
 eczema of, 64
 furunculosis of, 64
 Vibrissæ, 38, 64
 Vincent's angina, 219
 Vocal cords, 21, 253
 abduction of, 285
 adduction of, 285
 cadaveric position of, 288
 false, 21, 253
 fibroma of, 295
 polyp of, 295
 process, 252
 Voice, 259
 loss of, 289
 singing, 259
 whispering, 289, 293
 Vomer, 38, 76
 WALDEYER, ring of, 170
 Wandering rash, 331
 Wassermann test, 240
 Watson operation for deflected
 septum, 85
 Wharton's duct, 332
 obstruction of, 334
 Whispering voice, 289, 293
 Whooping-cough, 262
 Wrisberg, cartilages of, 252
 X-RAY, diagnosis by, 27
 of ethmoid cells, 152
 of frontal sinuses, 148
 of maxillary antrum, 140
 YERSIN and Roux's work in diph-
 theria, 229





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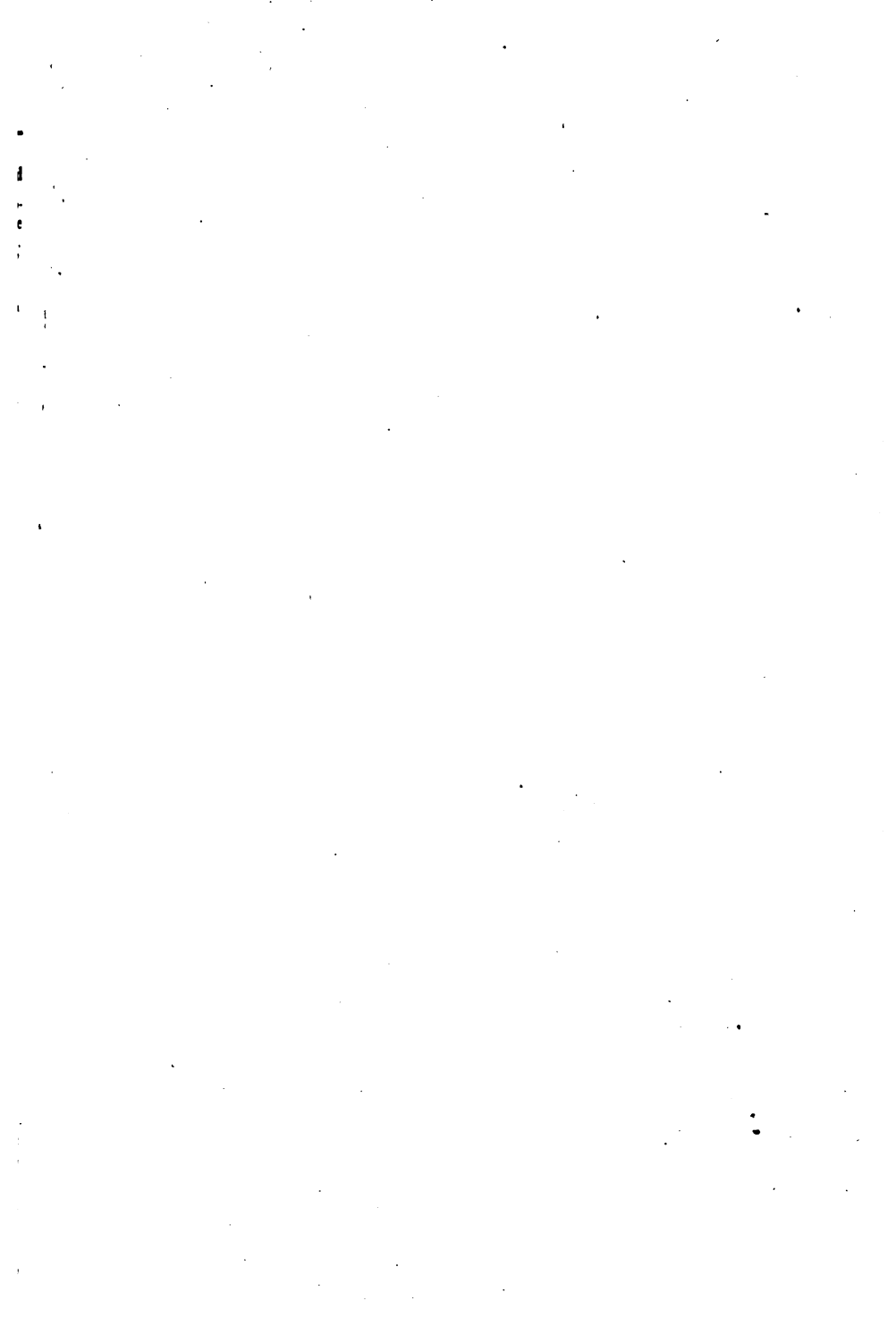
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